PIONEER
TECHNICAL SERVICES, INC.

P.O. Box 3445, Butte, MT 59702
(406) 782-5177 Fax (406) 782-5866

January 19, 2006

Gary Keeler
Landfill Manager
Department of Public Works
Butte-Silver Bow
126 W. Granite Street
Butte, Montana 59701

RE: Old Landfill Closure Certification Report

Dear Gary:

Attached is a certified copy of the Construction Quality Assurance Report for the Old Silver Bow Landfill. I had understood that the documentation provided previously to the Department of Environmental Quality previously was sufficient for this project. However, Tim Stepp of DEQ informed us that this document was necessary. Therefore, as you requested I have compiled this report to meet DEQ's requirements. I have forwarded a copy directly to Tim Stepp at DEQ, also.

If you have any questions or need anything else, please give me a call at 782-5177.

Sincerely,

Brad Archibald

Brad Archibald, P.E.
Principal Engineer

Enclosure

cc: Tim Stepp, DEQ (w/enclosure)

RECEIVED
JAN 23 2006
Dept. of Enviro. Quality
Waste & Underground
Tank Management Bureau

9 8'98

9 8'98

9 8'98

9 8'98

CONSTRUCTION QUALITY ASSURANCE REPORT

FOR THE

OLD BUTTE-SILVER BOW LANDFILL

FINAL COVER INSTALLATION

Butte-Silver Bow County
Department of Public Works
126 W. Granite Street
Butte, Montana 59701

RECEIVED
JAN 23 2006
Dept. of Enviro. Quality
Waste & Underground
Tank Management Bureau

JANUARY 2006

1/23/2006

CONSTRUCTION QUALITY ASSURANCE REPORT
FOR THE
OLD BUTTE-SILVER BOW LANDFILL
FINAL COVER INSTALLATION

Prepared For:

Mr. Gary Keeler, Landfill Manager
Department of Public Works
Butte-Silver Bow
Butte, Montana 59701

Prepared By:

Pioneer Technical Services, Inc.
P.O. Box 3445
Butte, Montana 59702

JANUARY 2006

1.0 INTRODUCTION

This Construction Quality Assurance Report (CQA Report) details the construction quality assurance procedures employed during the final cover installation at the old Silver Bow County Landfill, located on Beeftrail Road in Butte, Montana. This report covers the approximately four acres of the landfill that received waste after October 9, 1991 (see Figure 1-1). The balance of the landfill was closed in accordance with the Interim Closure Plan for the Butte-Silver Bow Landfill (Special Resource Management, March 26, 1993) in accordance with Solid Waste Program regulations in effect prior to October 9, 1991. These caps are part of the preferred remedy for the Old Silver Bow Lanfill identified in the Corrective Measures Assessment (Pioneer, 1997). This report is provided in accordance with the requirements of the Montana Department of Environmental Quality (DEQ) requirements detailed in the Administrative Rules of Montana (ARM).

CQA procedures during the final cover installation were conducted in accordance with the approved Construction Quality Assurance Plan (CQA Plan) for the Old Butte-Silver Bow Landfill Final Cover Installation (Pioneer, 1996). The CQA Plan was developed in accordance with U.S. Environmental Protection Agency (EPA) guidance for quality assurance and quality control at waste containment facilities (EPA, 1993).

This report also applies to the installation of the passive gas venting system, installed in accordance with the design plans submitted to the Department of Environmental Quality on May 13, 1997 and approved by DEQ via a letter from F. Patrick Crowley on May 20, 1997.

2.0 PARTIES AND RESPONSIBILITIES

The parties involved in installation of the landfill cap, and their individual responsibilities, are identified in this section.

2.1 PROJECT MANAGER

The Project Manager is the representative of Butte-Silver Bow responsible for the installation of the landfill cap in accordance with the regulations and the provisions contained herein. For this project, the Project Manager is Gary Keeler, Landfill Manager for the Butte-Silver Bow Department of Public Works. In addition to being responsible for the installation of the cap, it is the responsibility of the Project Manager to assure that all quality assurance protocols are followed. The Project Manager is also responsible for resolving any quality assurance discrepancies or other issues that arise during installation.

2.2 QUALITY ASSURANCE ENGINEER

The Quality Assurance Engineer (QAE) is responsible for observing, testing, and documenting activities related to the quality assurance of the installation of the landfill cap. The QAE works on behalf of the Project Manager to ensure compliance with the quality assurance program

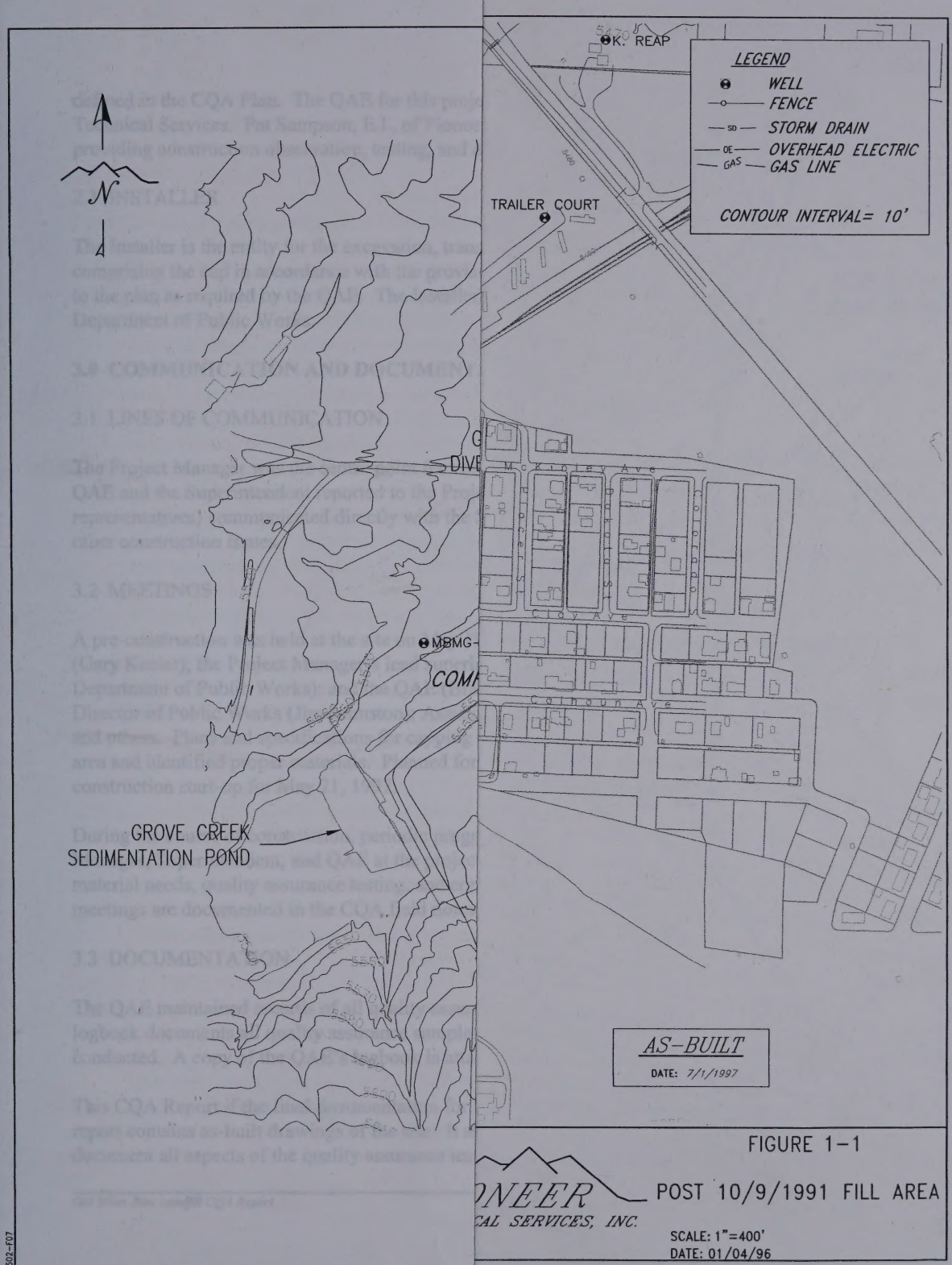


FIGURE 1-1

POST 10/9/1991 FILL AREA

SCALE: 1"=400'
DATE: 01/04/96

4502-F07

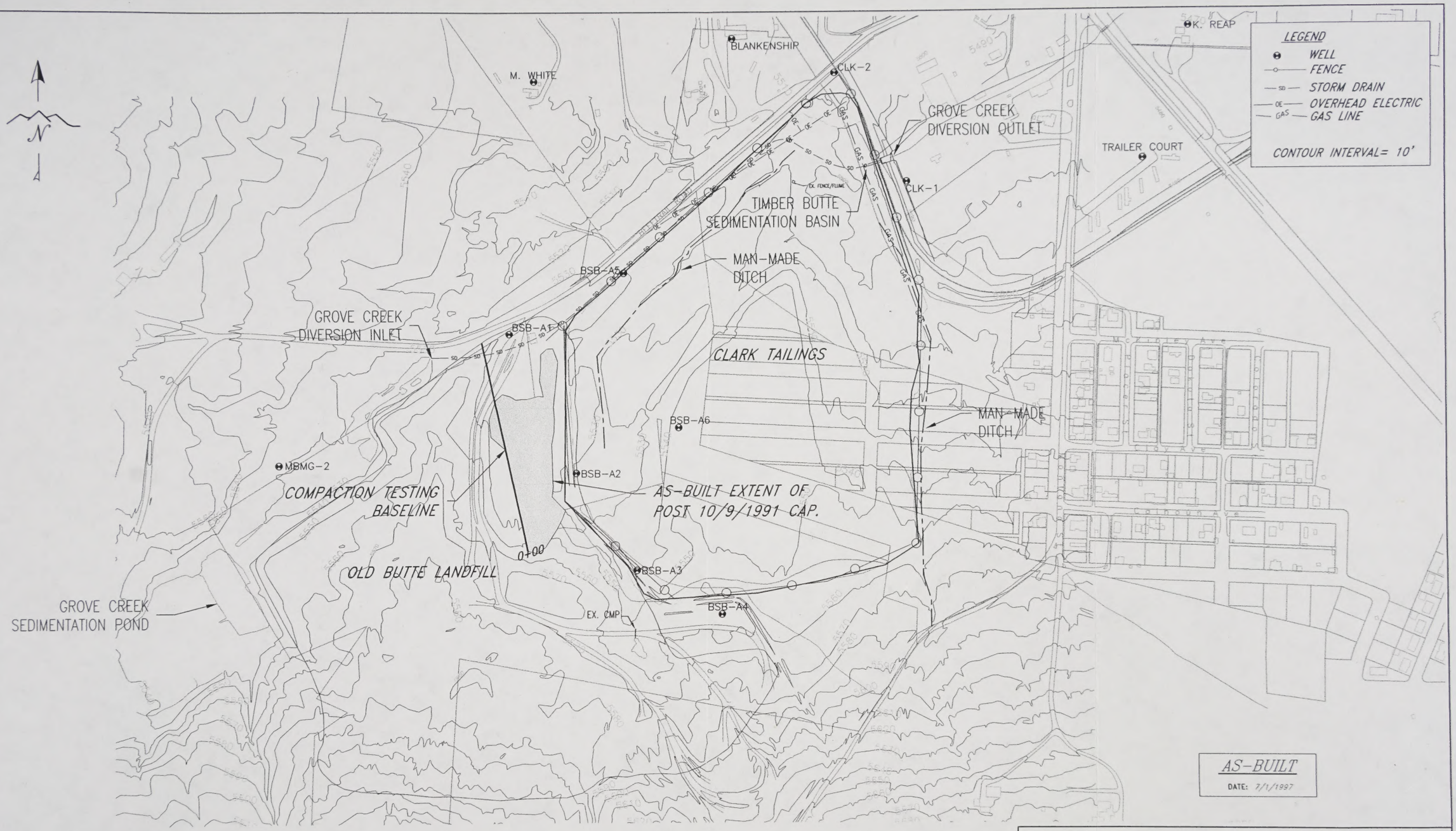


FIGURE 1-1

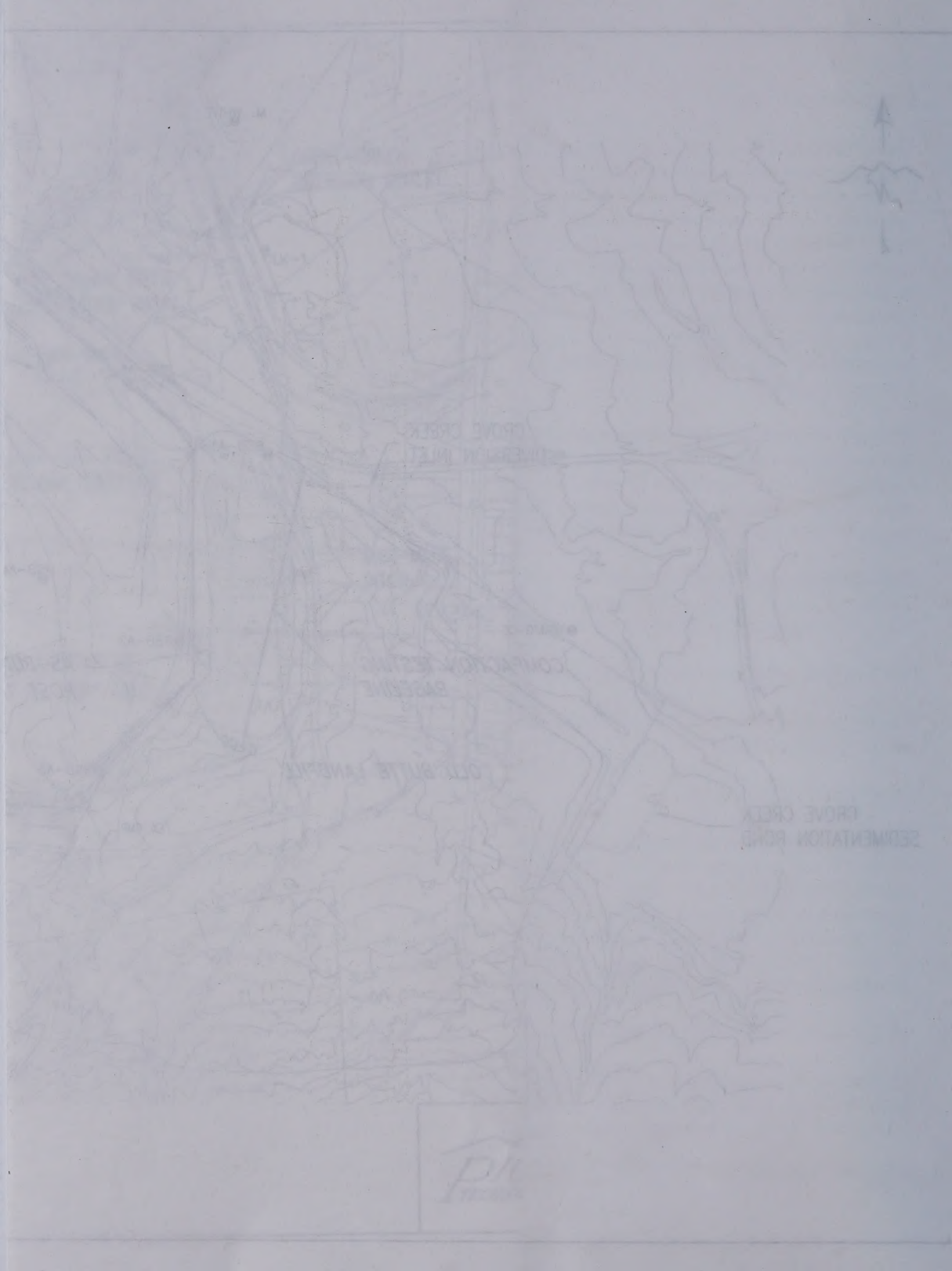
PIONEER TECHNICAL SERVICES, INC.

POST 10/9/1991 FILL AREA

SCALE: 1"=400'

DATE: 01/04/96

4502-F07



defined in the CQA Plan. The QAE for this project was Brad Archibald, P.E. of Pioneer Technical Services. Pat Sampson, E.I., of Pioneer Technical Services assisted the QAE by providing construction observation, testing, and documentation.

2.3 INSTALLER

The Installer is the entity for the excavation, transport, and installation of the materials comprising the cap in accordance with the provisions contained herein and site specific variations to the plan as required by the QAE. The Installer for the project was the Butte-Silver Bow Department of Public Works.

3.0 COMMUNICATION AND DOCUMENTATION

3.1 LINES OF COMMUNICATION

The Project Manager was the center point for communication lines for the project. Both the QAE and the Superintendent reported to the Project Manager. At times, the QAE (and his representatives) communicated directly with the Superintendent regarding testing results and other construction issues.

3.2 MEETINGS

A pre-construction was held at the site on May 19, 1997. In attendance were the Project Manager (Gary Keeler); the Project Manager's lead superintendent (Rich Dwyer from the BSB Department of Public Works); and the QAE (Brad Archibald). Also present were the BSB Director of Public Works (Jim Johnston); Assistant Director of Public Works (Dave Schultz), and others. Plans and specifications for capping were reviewed. Inspected the borrow source area and identified proper materials. Planned for detailed staking to be conducted, and scheduled construction start-up for May 21, 1997.

During the course of construction, periodic progress meetings were held with the Project Manager, Superintendent, and QAE at the project site. At the meetings, construction progress, material needs, quality assurance testing, and construction scheduled were reviewed. These meetings are documented in the CQA field notes (Appendix A).

3.3 DOCUMENTATION

The QAE maintained records of all quality assurance testing documentation. The QAE's logbook documents all quality assurance samples collected for laboratory analysis and field tests conducted. A copy of the QAE's logbook is attached as Appendix A.

This CQA Report if the final documentation for the project. As required by the CQA Plan, this report contains as-built drawings of the site. It also summarizes the activities of the project and document all aspects of the quality assurance testing conducted. All quality assurance testing

results and actions taken as a result of quality assurance testing are included. This report is certified by the QAE.

4.0 PROJECT SUMMARY

The following is a daily summary of construction and CQA activities during construction.

May 19, 1997: Pre-construction meeting held at the project site.

May 20, 1997: Construction staking and final planning completed.

May 21, 1997: Cover soil installation begins by BSB crews. QAE reviews progress, construction procedures with Superintendent.

May 22, 1997: Cover soil placement continues. Hauling from borrow source, stockpiling on site, and then spreading/compacting where fill required. Placing materials with plans for 2 lifts, each compacted to a minimum of 9 inches. As of this date, estimated approximately 4,200 loose cubic yards of material have been transported to the site. Most of this is stockpiled at the site. Visual observation by QAE indicates that the material is consistently the clayey sand material selected at the borrow source for the infiltration barrier portion of the cap. Established grid for CQA in-place density and moisture tests. Completed 5 tests. Instructed Superintendent to add water to cover soil as in place tests indicated material is slightly drier than optimum water content.

May 23, 1997: Low productivity day as equipment not available to construction crew. One in place compaction and moisture content test completed at northwest corner of fill. Low moisture and compaction density. Informed Superintendent of the results.

May 24-27, 1997: No work.

May 28, 1997: Completed 10 in place density and moisture content tests.

May 29, 1997: Informed Superintendent of areas that did not meet compaction and/or moisture requirements. Completed surveying of post-1991 fill area, planned cap area. Reviewed construction procedures with Project Manager. QAE made observations of stockpiled material and concluded it is proper material from borrow source.

May 30, 1997: Completed re-testing of areas that had previously failed compaction testing (and had subsequently been re-compacted, according to Superintendent and/or equipment operators). Found that upon recompaction most areas passed, except along the eastern fill slope. Informed Superintendent of this. Superintendent said they'd compact again, this time running in different direction (perpendicular to previous compaction efforts). Collected sample for CQA laboratory testing.

May 31, 1997: No work.

June 1, 1997: No work.

June 2, 1997: East slope not yet recompacted. Completed 8 in place compaction and moisture tests. Informed Superintendent that 5 of 8 did not meet specifications. Superintendent indicated having a difficult time keeping up with truck haul with the available compaction equipment. Informed Superintendent that needed to make sure compaction requirements were met.

June 3, 1997: Completed 12 in placed compaction and density tests between Stations 0+50 and 2+10. Eight of the 12 met specifications.

ability to meet the requirements for the infiltration barrier layer (i.e. k< 1.0E-05 cm/sec). These tests included gradations, moisture-density relationships (Proctors), remolded laboratory hydraulic conductivity tests, and in situ hydraulic conductivity tests on constructed test pads (Boutwell tests). The results of this preconstruction testing were presented in the Construction Quality Assurance Plan for the Clark Tailings Waste Management Area (Pioneer, April 1997). Copies of the pre-construction test results are attached as Appendix B and are summarized here

When the Hollow/Lavelle pit was first identified as a potential cover soil source, a sample was collected and analyzed for remolded hydraulic conductivity via ASTM D5084. This sample was classified as a clayey sand (SC); the saturated hydraulic conductivity was measured at 3.6E-06 cm/sec. A copy of the results are included in Appendix B.

Based on those results, the material was selected as a potential cover material for both the Old Silver Bow Landfill and the adjacent Clark Tailings. Therefore, test pads were constructed in 1996 to characterize the materials and test their hydraulic conductivity in site. (The test pad of this material was one of four constructed at this time.) Test pad construction results were included in the Clark Tailings Waste Management Area CQA Plan. As part of the test pads, the following samples were collected. (Sample results are included in Appendix B.)

Sample Number	Description	Results
Sieve Analysis, Atterberg Limits		
26, CTTP4, Lift 2	Sample from 2nd lift of test pad	Soil Classification: SC 33.3% < No. 200 Plasticity Index =7.2
25, CTTP4, Lift 3	Sample from 3rd lift of test pad	Soil Classification: SC-SM 35.1% < No. 200 Plasticity Index =6.9
Compaction Curves (Proctors)		
Hollow Silty-Sand 1	Preconstruction sample from source, Plate P-8	Max. dry density = 122.0 pcf, Optimum moisture content = 12.5%
Hollow Silty-Sand 2	Preconstruction sample from source, Plate P-9	Max. dry density = 122.0 pcf, Optimum moisture content = 12.5%
25, CTTP4, Lift 3	Sample from 3rd lift of test pad	Max. dry density = 120.0 pcf, Optimum moisture content = 13.0%

In situ hydraulic conductivity tests were also conducted on the test pad by NTL Engineering and Geoscience, in accordance with the "Two-Stage Borehole Field Permeability Test" (aka Boutwell) test method. This testing indicated an average vertical permeability of 1.6E-07 to 5.2E-07 cm/sec, comfortably meeting the required 1.0E-05 cm/sec requirement.

Based on the test pad results, the SC-SM material from the Hollow borrow source was selected for the infiltration barrier layer on the portion of the landfill that received waste after October 1, 1991. As noted in the CQA Plan, additional testing of the material was necessary to during construction to verify the quality of the materials. During construction, the following samples were collected and analyzed. (Sample results are included in Appendix C.)

Sample Number	Description	Results
Moisture Content		
NG22	Sample from location of nuclear density gauge test No. 22, 6/2/97	% moisture = 9.2% (Field moisture per ASTM D3017 was 7.4%)
NG27	Sample from location of nuclear density gauge test No. 27	% moisture = 9.9% (Field moisture per ASTM D3017 was 11.0%)
NG44	Sample from location of nuclear density gauge test No. 44.	% moisture = 8.7% (Field moisture per ASTM D3017 was 10.5%)
NG48	Sample from location of nuclear density gauge test No. 48	% moisture = 9.6% (Field moisture per ASTM D3017 was 10.2%)
Sieve Analysis, Atterberg Limits		
5/30/1997	Cover material from Station 3+30, 130' East	Soil Classification: SC 27.3% < No. 200 Plasticity Index = 12
6/05/1997	Cover material composite sample.	Soil Classification: SC 28.9% < No. 200 Plasticity Index = 12
Compaction Curves (Proctors)		
5/30/1997	Cover material from Station 3+30, 130' East	Max. dry density = 128.2 pcf, Optimum moisture content = 9.8%
6/05/1997	Cover material composite sample.	Max. dry density = 124.1 pcf, Optimum moisture content = 10.3%

The samples, coupled with the pre-construction samples at the borrow area, meet (and in most cases exceed) the frequency of borrow area sampling identified in the CQA plan.

4.1.2 Preprocessing of Materials CQA

CQA personnel will observed preprocessing of the infiltration barrier layer materials during construction. Preprocessing primarily consisted of adjusting water content. The material from the borrow source did not contain significant amounts of oversize material and was consistent and homogenous, thus not requiring mixing or segregation.

4.1.3 Placement of Loose Lifts CQA

CQA personnel observed placement of loose lifts and reviewed lift thickness (pre and post-compaction) plans with the Superintendent and construction personnel. Lifts were placed to achieve a minimum compacted lift thickness of 9 inches; in many cases, thicker lifts were placed to achieve the overall cover thickness requirement of 24 inches in two lifts. In these cases,

compaction tests were completed to ensure that the compaction specification was achieved (see below).

CQA personnel also visually inspected the loose lifts to ensure that the lift did not contain deleterious material such as stones, debris, and organic matter. Temperatures remained well above freezing during the cover installation, so there were no concerns about frozen subgrades of frozen chunks of material in the lift.

As noted above (under Laboratory Testing), samples were collected from the loose lifts for laboratory testing. Two standard Proctor (ASTM D 698) tests were conducted, meeting the CQA Plan's objective of one for each 5,000 cubic yards of material placed. In addition, the QAE may also collected two samples for sieve analysis and Atterberg limits (ASTM D 4318) to assure that the material met the specifications contained herein..

4.1.4 Remolding and Compaction CQA

CQA personnel observed and tested the compaction of the infiltration barrier layer soils. Observations included the type and number of passes of compaction equipment. Based on these observations and associated testing, the CQA personnel, Superintendent, and Operators developed an understanding of the number of passes necessary to obtain the compaction specification. Then, periodically during the remainder of the cover installation, the CQA personnel observed compaction to ensure that the minimum number of passes was made.

CQA personnel also tested the compacted soil to ensure that it meets the compaction, moisture content, and lift thickness specifications. Compacted lift thickness were measured by level surveys conducted by the Superintendent and checked periodically by the QAE. The target frequency for compacted lift testing, as identified in the CQA Plan, is shown on the following table.

PARAMETER	TEST METHOD	TESTING FREQUENCY
Water Content	ASTM D 3017	5 per acre per lift
Density	ASTM D 2922	5 per acre per lift
Number of Passes	Observation	1 per acre per lift

The compaction specification cited in the CQA Plan was 90% of the maximum dry density at 0 t 4% above optimum moisture content. Because the material being for the cover was from a slightly different location than the initial remolded hydraulic conductivity test (although from the same soil unit) and the fact that the test pad that was constructed to perform in situ hydraulic conductivity tests was compacted to approximately 95% of the maximum dry density, the QAE determined that the compaction target should be 95% of the maximum dry density. Therefore, the following discussion is based on that target.

Based on the approximately four acres that received final cover under the CQA Plan, and the fact that the infiltration barrier layer was placed in two lifts, a total of 40 in place water content and density tests were planned. As shown in Appendix D, a total of 59 tests were actually conducted. However, 12 of these tests were re-tests of tests that initially did not meet compaction specifications (and were subsequently recompacted). Therefore, a total of 47 unique compaction tests were conducted, satisfying the frequency called for in the CQA Plan. Of the initial tests, 21 did not meet the 95% compaction specification. The Superintendent was notified and all of these locations were recompacted. Of these 21 failing tests, 12 were retested. The remaining 9 were not retested for a variety of reasons, but mostly because a subsequent lift was placed and the original test location was covered. (Note that in some areas, the overburden was removed and the original test was repeated, but not in all locations.)

As a result, there are 38 tests that represent as-built conditions: 59 original tests minus 12 that were re-tests minus 9 test locations that were recompacted but not retested. The average compaction of these 38 tests was 98.2% of the maximum dry density. This is based on the 122.0 pound per cubic foot maximum dry density for two of the three pre-construction Proctor curves. The third pre-construction curve had a maximum dry density of 120.0 pcf. The Proctor's for samples collected during construction showed a slightly higher maximum dry density and slightly lower optimum moisture contents. Three of the 38 tests individually did not meet the compaction specification. Two of these three were greater than 94.5%; the third was at 92.3% of the maximum dry density. Although this failure rate is slightly higher than the allowable rate recommended by EPA (1993), in the QAE's opinion it was acceptable due to the variability of the soil (had the 120.0 pcf Proctor been used, only one sample would not meet the 95% compaction specification); the fact that the original specification was for 90% of the maximum dry density (all of the samples met this specification); and the fact that the in situ tests indicated an average hydraulic conductivity of 2.8E-07 cm/sec, nearly two orders of magnitude less than the required 1.0E-05 cm/sec.

Moisture content in the 38 representative tests averaged 11.5%, 1% drier than the optimum moisture content from the pre-construction Proctors, but from 1.7 to 1.2% moisture than the optimum moisture from the samples collected during construction. From the various samples, optimum moistures ranged from 9.8% to 13.0%. All individual samples fell within the allowable tolerance for moisture content.

4.2 LANDFILL GAS VENTING SYSTEM CQA

During installation of the landfill gas venting system, the QAE performed construction surveying and staking to assure the proper layout of the system in accordance with the approved design. A copy of the plan is included in Appendix E.

After the trenches for installation of the gas venting system were excavated, the QAE inspected the trenches to assure that they went through the infiltration barrier layer and into the underlying waste (so that they would be effective in collecting landfill gas). These observations are

documented in the field notes (Appendix A). The QAE also observed installation of the gravel (to assure compliance with the specifications) and installation of select pipe and fittings. Lastly, after backfilling was completed, compaction tests of the backfill infiltration barrier layer materials was completed to assure proper compaction.

4.3 EROSION/SEED BED LAYER CQA TESTING

A 6-inch minimum layer of native material capable of supporting vegetative growth was planned to be installed over the infiltration barrier layer. For this layer, the same clayey and silty sand material used for the infiltration barrier layer was used. In some areas it was placed over the compacted infiltration barrier layer, and in some places it was placed and compacted with the upper lift of infiltration barrier layer materials. Where this was the case, the uppermost few inches were ripped prior to seeding and fertilizing. Total lift thickness was observed during placement and checked during installation of the gas venting system, as described above.

After this lift was completed, the area was fertilized and seeded with a native vegetation mix. Straw mulch was applied and crimped into the soil as a Best Management Practice (BMP) to mitigate erosion potential during grow-in. Straw bales were also placed across the drainage to the southeast of the cap area as a BMP.

5.0 CONCLUSIONS AND CERTIFICATION

Based on the observations, testing, and documentation described herein, the portion of the Old Silver Bow Landfill that received waste after October 9, 1991 (as reported by Gary Keeler, Landfill Manager) was capped in accordance with the approved plans in the Corrective Measures Assessment (Pioneer, 1997) and the CQA Plan (Pioneer, 1996). Furthermore, the landfill gas venting system was also installed in accordance with the DEQ-approved plans for the system (Crowley, 1997).

6.0 REFERENCES

EPA, 1993. Technical Guidance Document: "*Quality Assurance and Quality Control for Waste Containment Facilities,*" EPA/600/R-93/182, U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C., September.

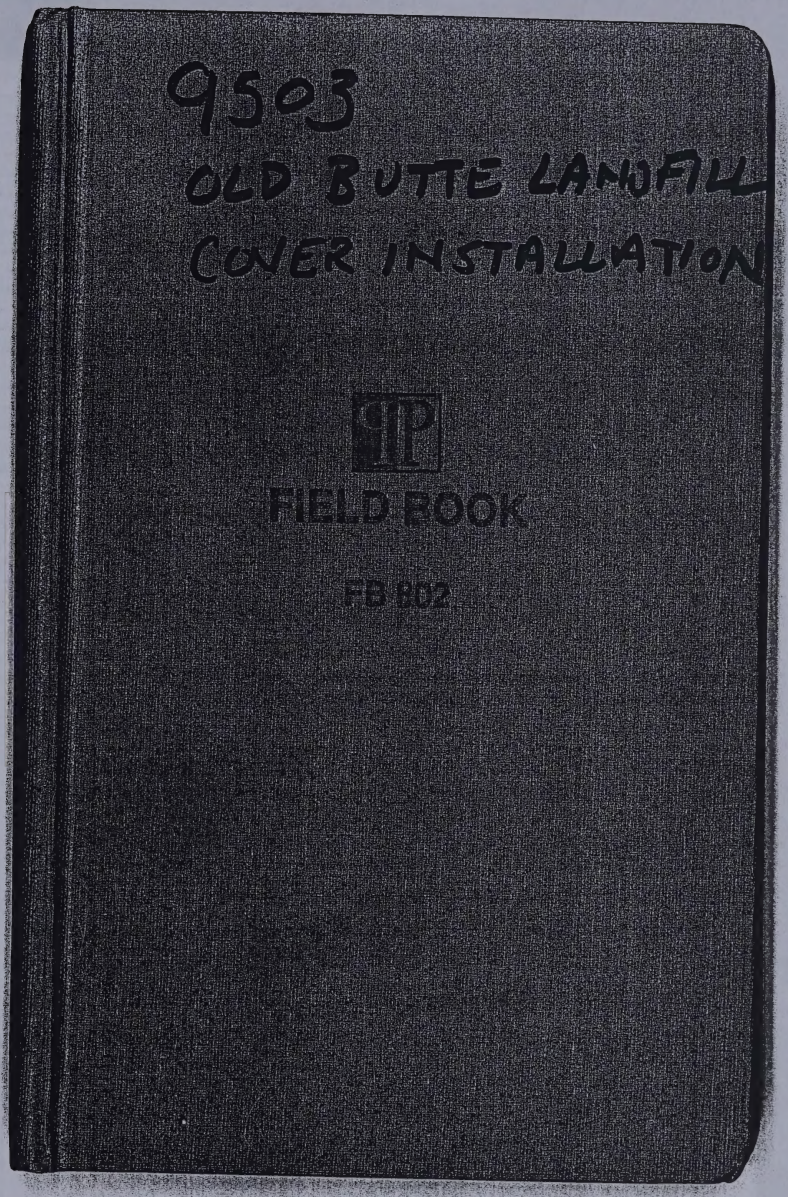
Pioneer Technical Services, 1996, *Construction Quality Assurance Plan for the Old Butte-Silver Bow Landfill Final Cover Installation*, prepared for Butte-Silver Bow, January.

Pioneer Technical Services, 1997, *Final Draft, Butte-Silver Bow Landfill/Clark Tailings Corrective Measures Assessment*, prepared for Butte-Silver Bow, January, as amended via a February 4, 1997 letter to F.P. Crowley, DEQ, from B. Archibald, Pioneer, in response to DEQ comments.

SRM, 1993. "*Interim Closure Plan for the Butte-Silver Bow Landfill.*"

APPENDIX A

CQA Personnel Logbook


9503
OLD BUTTE LANDFILL
COVER INSTALLATION
FIELD BOOK
FB 802

5/19/97 - ARCHIBALD

0900 Met GARY KEELER, JIM JOHNSTON, RICH DWYER, DAVE SCHULTZ, JOE MULVANEY, JIM MCCARTHY @ LANDFILL. COUNTY CREWS WILL START CLEARING THIS MORN. RICH DWYER WILL BE COUNTY'S ENGINEER/SURVEYOR FOR THIS JOB.

THEY WILL GRADE AREA TO BE CAPPED AND GRIND SPOTS IN THE OLD COVER TODAY AND TOMORROW. BEGIN HAULING IN COVER SOIL FROM HOLLOW PIT TOMORROW.

PIONEER WILL STAKE PERIMETER FROM CONTRACT THIS P.M.

WENT TO BORROW SOURCE @ HOLLOWS W/ JIM MCCARTHY AND RICH DWYER. SHOWED THEM THE TWO TYPES OF MATERIAL IN THE PIT (SANDY CLAY AND DEC. GRANITE). TOLD THEM WE NEED THE SC MATERIAL.

5/20/97 - ARCHIBALD

MET RICH DWYER @ LANDFILL 1 PM. ALSO, GARY KEELER. THE AREA STAKED IS MUCH PRE-91 WASTE - THE POST-91 AREA EXTENDS SOME TO THE WEST, PER GARY KEELER. MOVED STAKES ACCORDINGLY - PIONEER SURVEY CREW WILL LOCATE NEW LINE.

COVERED PRE-91 AREAS THAT NEED WORK. GARY WILL MEET W/ BERNIE JENSEN RE: SLOPING REQUIREMENTS.

5/21/97 - ARCHIBALD

ARRIVED @ LANDFILL @ 3:15 p.m. No work going on; they appear to be done for the day. They've placed some cap material. They are spreading and compacting w/ a CAT 816B Compactor. I had told RICHIE DWYER TO PLACE IN A MINIMUM OF 2 - 9" LIFTS. THEY APPEAR TO BE FOLLOWING THIS.

5/22/97 - ARCHIBALD

MET RICH DWYER AND GARY KEELER AT LANDFILL @ 1400. THEY ARE DONE COMPACTING FOR THE DAY, BUT ARE STILL HAULING/STOCKPILING MATERIALS.

ESTABLISHED BASELINE ALONG WEST EDGE OF CAP. TAKE DENSITY READINGS 1, 2, 4, 5 IN AREAS THAT ARE COMPLETE, ACCORDING TO RICHIE. BASED ON THE PROCTORS FROM THE TEST PAD CONSTRUCTION, THESE ARE SATISFY THE COMPACT (95%) SPEC. THEY ARE AT OR JUST DRY OF OPT. MOISTURE.

TESTS 3 & 4 ARE ~~WEST~~ EAST OF THE COMPLETED AREA, WHERE MATERIAL HAS BEEN SPREAD AND ONE PASS OF THE COMPACTOR. BOTH OF THESE TESTS A LITTLE LIGHT OF COMPACT. SPEC. RICHIE SAID HE'S HAD COMPACTOR MAKING PASSES EACH DIRECTION (90° OFFSET FROM EACH OTHER) BEFORE HE FEELS IT'S DONE; HE'LL HAVE THEM COMPLETE THESE AREAS TOMORROW AND WE CAN RE-TEST.

I TOLD RICHIE THAT THE MATERIAL ARE A LITTLE DRIER THAN WE'D LIKE, TO ADD A LITTLE WATER JUST BEFORE COMPACTING. HE SAID THAT HE WOULD. I STRESSED TO HIM TO WATCH LIFT THICKNESS.

THRU TODAY, RICHIE ESTIMATES ABOUT 350 TRUCK LOADS TO DATE, ABOUT 12 yds LOOSE EACH. MUCH OF THIS IS STOCKPILED @ THE SITE. ALL OF IT AT THE LANDFILL IS THE SC MATERIAL.

5/23/97 PAT SAMPSON
10:30

Talked w/ MR. Dwyer. Slow day They waited for DOZER until 10:30 & Their leaving a 2:00 not many loads of fill. Asked to take one test at North-West corner of fill. One Test @ N-W corner Low compaction picture #2 of compactor over test. Told MR. Dwyer I'll be back on Tuesday Morning to test everything
Left site @ 11:15

5/28/97 PAT SAMPSON
2:30 PM
Nobody around Taking Tests
Completed 10 NG Test
Starting @ NW corner, most tests taken around outside Edge of fill
The center is hard because of Truck Traffic compacting.
Left site @ 3:45 PM

5/29/97 BRAD ARCHIBOLD
CALLED RICH DWYER, BSB - INFORMED HIM THAT A FEW OF THE TESTS WERE A LITTLE LIGHT ON COMPACTION. (TESTS 14 THRU 16).

ARRIVED @ SITE @ 1000. MET W/ GERALD G. AND STEVE L. OF PIONEER THEY WILL SURVEY IN LOCATION OF POST-41 CAP, AS STAKED BY GARY KEELER AND RICH DWYER.

TOM GARY KEELER AND ED KELLY ED IS RUNNING ~~DOZE~~ COMPACTOR. HE IS SPREADING EACH LIFT TO 12" LOOSE LIFT AND THEN COMPACTING. LATE THEN COMES

5/29/97 CONT'D

BACK AND SPREADS IN 2ND 12" LOOSE LIFT OVER THE FIRST LIFT, AND COMPACTS. HE SAYS HE'S GETTING 18" COMPACTED IN THIS WAY.

ED SAID HE'S DONE W/ EVERYTHING FROM 4+55 TO THE NORTH, EXCEPT THE EXTREME EASTERN SLOPE. HE RECOMPACTED THE AREAS THAT WERE A LITTLE LOOSE; PIONEER NEEDS TO RE-CHECK.

OBSERVED MATERIAL IN PLACE AND THE STOCKPILE. IT IS ALL THE CLAYEY SAND (SC) FROM HALLOCK'S.

5/30/97 BRAD ARCHIBALD

ARRIVED AT SITE @ 0900. NOBODY WORKING - THEY ARE WARMING UP EQUIPMENT @ HALLOCK'S PIT. SUNNY, 60°

RETESTED AREAS THAT HAD FAILED PREVIOUSLY. THESE WERE OKAY.

TESTED AREA OF EASTERN-MOST SLOPE. STILL A LITTLE LOOSE IN SOME AREAS. TOLD RICK DAVER ABOUT THIS; HE SAID HE'D HAVE IT COMPACTED AGAIN, THIS TIME RUNNING ACROSS SLOPE.

GARY KLEEGER ARRIVED ON SITE @ 0930.

PHOTOGRAPHS OF SITE; STATUS of CAPPING.

COLLECTED SAMPLE FOR INDEX PROPERTIES FROM SOUTH EDGE OF CAPPING ACTIVITIES.

TRUCKS STARTED HAULING @ 0930.

5, 6/2/97 Pat Sampson
Jan Maxwell
, 9:05 Arrived at site
Talk to Richie, East slope heads
T. have re compacted, talk him to get it.
Th Take tests at south End.
F Took 8 Tests on south end.
Sa I told Richy to make sure he's
N compacting, he's complaining that
@ he's just trying to keep up with
# the trucks.
M Left site @ 10:30
T
W 6/3/97
1330 Arrived on Site
No one around to Talk to
Equipment working East
Trucks Hauling out The
Gate I Drove in on.
Taking Tests on the South
End of Designated Area
Standard Count: h20
~~Xi 1.79 wet~~ 1.0
~~Ct 1456~~

	WET	H20
PRV	14875	18917
Std	15282	17785
Xi	.96	.99

Cont 970603 970603
There is STILL Unsuitable Material
Piled from 0+50 → 0+00
SO Never took any NG
Readings Blw Sta 0+00 to 0+50
Left Site 1445

6/4/97 BRAD ARCHULETA

1300 ARRIVED @ SITE. LARRY, JJJ, IS GRADING CAPPED AREAS. COMPACTOR ON-SITE, BUT PARKED. LARRY TOLD ME HE IS ALSO WORKING ON ESTABLISHING DITCHES.

COLLECTED SAMPLE OF CAP MATERIAL FROM NORTH EDGE OF CAP, WHERE THEY ARE CAPPING THE TANK AROUND THE JUNK VEHICLE AREA.

THEY APPEAR TO HAVE DONE MORE COMPACTING. RETESTED AREAS THAT PREVIOUSLY FAILED.

TOLD LARRY THAT AREA FROM 0+00 TO ≈ 2+00, FROM ≈ 80' E TO THE EDGE,

WAS STILL LIGHT; NEEDED TO BE RECOMPACTED.

OFFSITE @ 1500.

CALLED RICH BUYER; TOLD HIM AREA THAT NEEDED MORE COMPACTION.

6/9/97 Pat Sampson

Arrived @ site 1530

Nobody @ site

Completed 8 NG Test on South area

Left site @ 1630

6/10/97 Brad Archibald

Talked w/ Rich Buyer. He said they had rolled the light area except for the extreme southeastern corner. They plan on putting garbage excavated from the gas trenches in this low area and compacting/capping. They will start on gas trenches tomorrow.

6/11/97 Brad Archibald

0800 Arrived @ site. 2 county excavators. One is removing cover soil in SE portion of Rust-91 area (to place garbage). Other is trenching on west vent line. At station 7+90, cover soil depth = 26 inches.

Left site @ 0845

1030 Talk Richie Buyer & Gary Keeler. They are on-site. Asked Richie to measure depth of cover soil in the excavated trenches. He said so far, it's been averaging about 2 feet.

They plan to start laying perf pipe tomorrow.

6/18/97 BRAD ARCHIBALD

0845 ARRIVED ON-SITE. TRENCHING FOR GAS SYSTEM APPROX 60% COMPLETE. WATER DEPARTMENT CREW ON-SITE BEGINNING TO INSTALL GAS VENT (STARTING @ NW CORNER).

WALKED TRENCHES TO CHECK PROPER DEPTH. MADE SURE IT WAS ALWAYS THRU THE FINER-GRAINED MATERIALS AND IN TO THE COARSE SAND OR GARBAGE. THIS WAS TRUE IN THE TRENCHES CONSTRUCTED THUS FAR. SOME OF THE TRENCHES WERE SLIGHTLY DEEPER THAN NECESSARY. TKW KAY (EXCAVATOR OPERATOR) AND TOLD HIM DEPTH CRITERIA.

MEASURED DEPTH OF COVER SOIL IN LATERAL TRENCHES 2nd and 3rd TRENCH FROM THE NORTH, THE FIRST ISN'T CUT YET). DEPTH OF COVER SOIL VARIES FROM 24" TO OVER 36". IN THE WEST TRENCH, COVER SOIL THICKNESS RANGES FROM 18" TO 30". (THIS IS IN PORTIONS THAT WERE CAPPED PREVIOUSLY BY THE JOB CORPS AND BSB). THE AREA WITH MARGINAL COVER SOIL DEPTH IS BETWEEN THE 2ND AND 3RD LATERALS.

TRASH FROM THE TRENCHES IS BEING HAULED TO AN AREA WITHIN THE POST 91 FILL AREA (ON THE SOUTH PORTION). COVER SOIL (CLAY) WAS STOCKPILED AND WASTE BEING PLACED. CAP WILL BE RE-INSTALLED UPON COMPLETION. TOLD RICHIE DWYER ABOUT THIN CAP AREA. HE SAID THEY'D BLADE FROM THICKER AREAS OR BRING IN MORE COVER SOIL.

IN POST 91 CAP AREA, RICHIE SAID THEY'D BACKFILL TRENCH W/ LOADER AND THEN ROLL W/ Grader or Compactor. I TOLD HIM TO DO IT IN LIFTS AND THAT WE HAD TO GET 95%. INSTRUCTED HIM TO CALL ME WHEN THEY START AND I WOULD DO DENSITY TESTING AS BACKFILL IS PLACED.

LEFT SITE @ 1050

ARRIVED @ SITE 1445. 2 EXCAVATORS WORKING ON TRENCHES, REST OF CREW GONE. WALKED LATERAL 1 (NORTHERNMOST)

6/12/97 BJA

AND EAST TRENCH TO OBSERVE DEPTH AND SUBGRADE. SUBGRADE GOOD, ALWAYS DOWN TO GARBAGE OR COARSE SOILS. DEPTH OF COVER GOOD EVERYWHERE EXCEPTION OF LATERAL 1, APPROX 100 TO 120 FEET EAST OF WEST TRENCH. DEPTH IN THIS AREA ≈ 18".

ALSO VIEWED SOUTHERN 1/2 OF WEST TRENCH AND EASTERN PORTIONS OF LATERALS 4, 5, 6. DEPTH OF COVER GOOD; SUBGRADE GOOD.

OFF SITE @ 1600.

6/13/97 BJA ARCHIBALD

RAIN, 65°.

ARRIVED ON-SITE @ 1430. CREWS ARE PULLING OFF-SITE. TALK RICHIE BUYER; VERY LITTLE PROGRESS TODAY DUE TO BAD WEATHER. COULDN'T GET LOADER TO TRENCH TO POUR GRAVEL.

KAY IS ON EXCAVATOR INSTALLING DITCH TO DRAIN CAR BODIES AREA.

OFF SITE @ 1600.

6/16/97 BJA Archibald

1115 ARRIVED ON-SITE. CREW IS OFFLOADING 6" PERF PVC. INSTALLERS ARE @ LUNCH. CHECKED TRENCHES AND BEDDING; OKAY.

1200 LEFT SITE.

6/25/97 BJA

ARRIVED ON SITE @ 1000. CHECKED LAYOUT/CONSTRUCTION OF VENTS. APPEARED GOOD. ALSO TESTED COMPLETION OF TRENCH BACKFILL.

APPENDIX B

Pre-Construction Testing Results

Permeability Test

ASTM D 5084 (Method C: Falling Head, Rising Tailwater)

Project: BJRX-95-066A
LAO Segment II
Phase I
Butte, Montana

Date: 04/16/96

LANDFILL / HOLLOW PIT

Field No.: 51 **Sample:** 96104 **Depth:** --- **Location:** BSB WWTF Stk Pile

Sample Description: Clayey Sand, fine to coarse grained, low plasticity, light brown, moist.
Remolded

	Initial		Final	
Wt Specimen + Tare Wet:	669.60		Wt Specimen + Tare Wet:	
Wt. Specimen + Tare Dry:	626.00		Wt. Specimen + Tare Dry:	
Wt. Tare:	120.70		Wt. Tare:	
Moisture Content:	8.6%		Moisture Content:	ERR

Initial Diameter (in):	2.9	Initial Area, A (in2):	6.47	Initial Wt. (gm):	655.10
Initial Ht. (in):	3.0	Initial Dry Unit Wt. (pcf):	117.6	Initial Saturation:	ERR
Final Ht., L (in):	3.0	Final Area, A (in2):	6.47		
Final Diameter (in):	2.9	Final Dry Unit Wt. (pcf):		Final Saturation:	ERR
Sp. Gravity:					

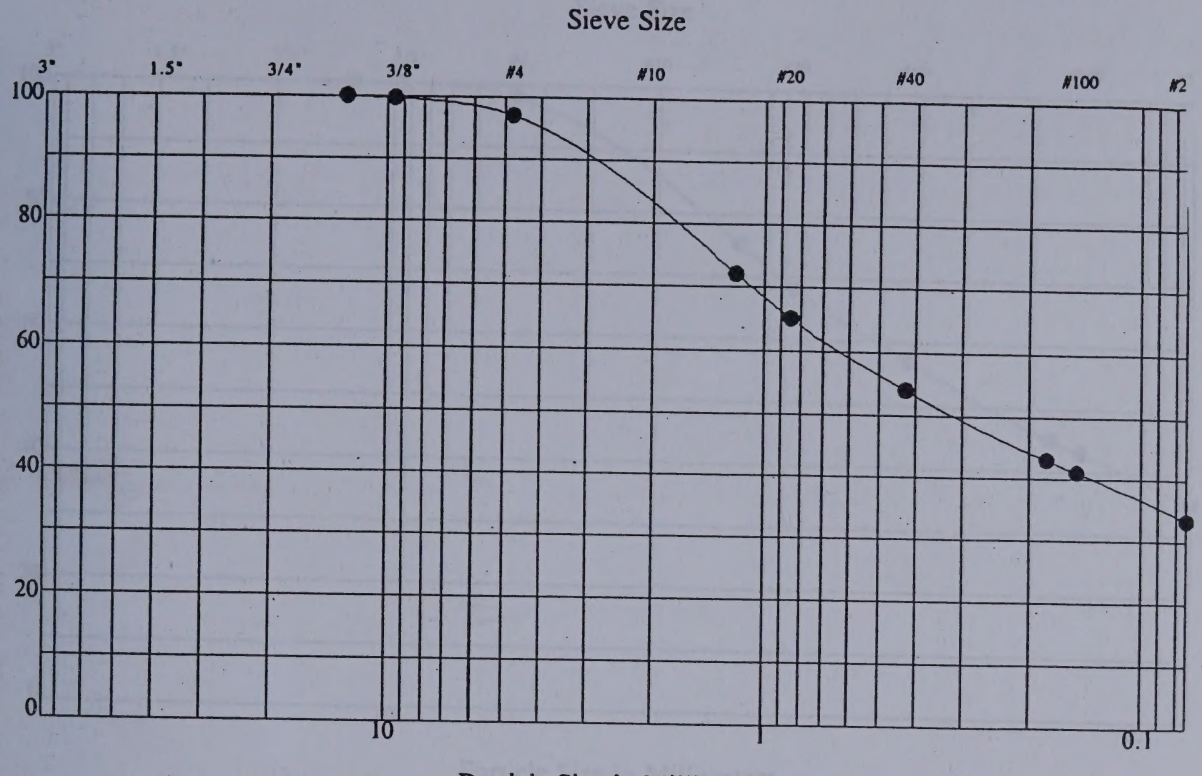
Burette Area, a (cm2):	1.00			Permeant Liquid:	De-aired, de-ionized water
Operating Pressures (psi):	Cell:	100.0		Head: 95.0	Tail: 95.0
Maximum Effective Consolidation Pressure (psi):		5.0		Overburden (psf):	720.0
Minimum Effective Consolidation Pressure (psi):		5.0		Overburden (psf):	720.0
Skempton's B coefficient:	1.0				

	Time (t) sec	H1 cm	H2 cm	hi cm	hf cm	havg cm	Average Hydraulic Gradient	Method C K cm/sec
Initial	0	0.7	49.5	48.8				
Final	9420	8.2	42.0		33.8	41.3	13.7	
Result								3.5E-06
Initial	0	0.4	49.4	49.0				
Final	5880	5.5	44.3		38.8	43.9	14.5	
Result								3.6E-06
Initial	0	5.5	44.1	38.5				
Final	6480	9.9	39.8		29.9	34.3	11.3	
Result								3.6E-06
Initial	0	9.9	39.8	30.0				
Final	10440	14.8	34.9		20.1	25.0	8.3	
Result								3.5E-06
Average Permeability								3.6E-06
Assigned Permeability								

Remarks: The specific gravity was assumed for the purpose of saturation calculations.

Materials Engineer

Sieve Analysis (ASTM C 136, C 117)



Gravel		Sand		
Coarse	Fine	Coarse	Medium	Fine

Percent Passing U.S. Standard Sieve Size

3"	3/4"	3/8"	#4	#10	#20	#40	#50	#100	#200
100	100	100	97	81	65	54	49	41	33.3

Sample No.: 26 Lab No.: 96282 Depth: Lift 2
Location: CTTP4

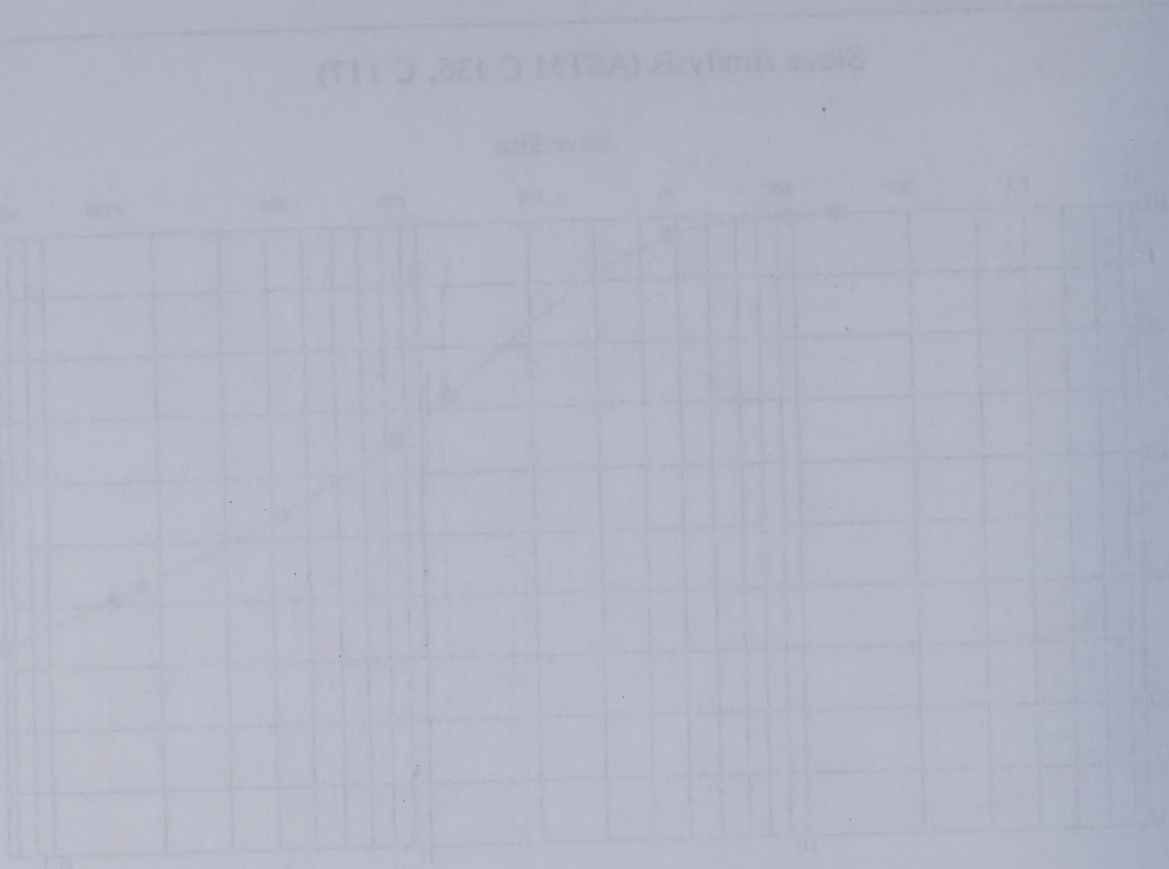
Percent Gravel: 3.0
Percent Sand: 63.7
Percent Silt + Clay: 33.3

Atterberg Limits (ASTM D 4318)
Moisture Content (ASTM D 2216)

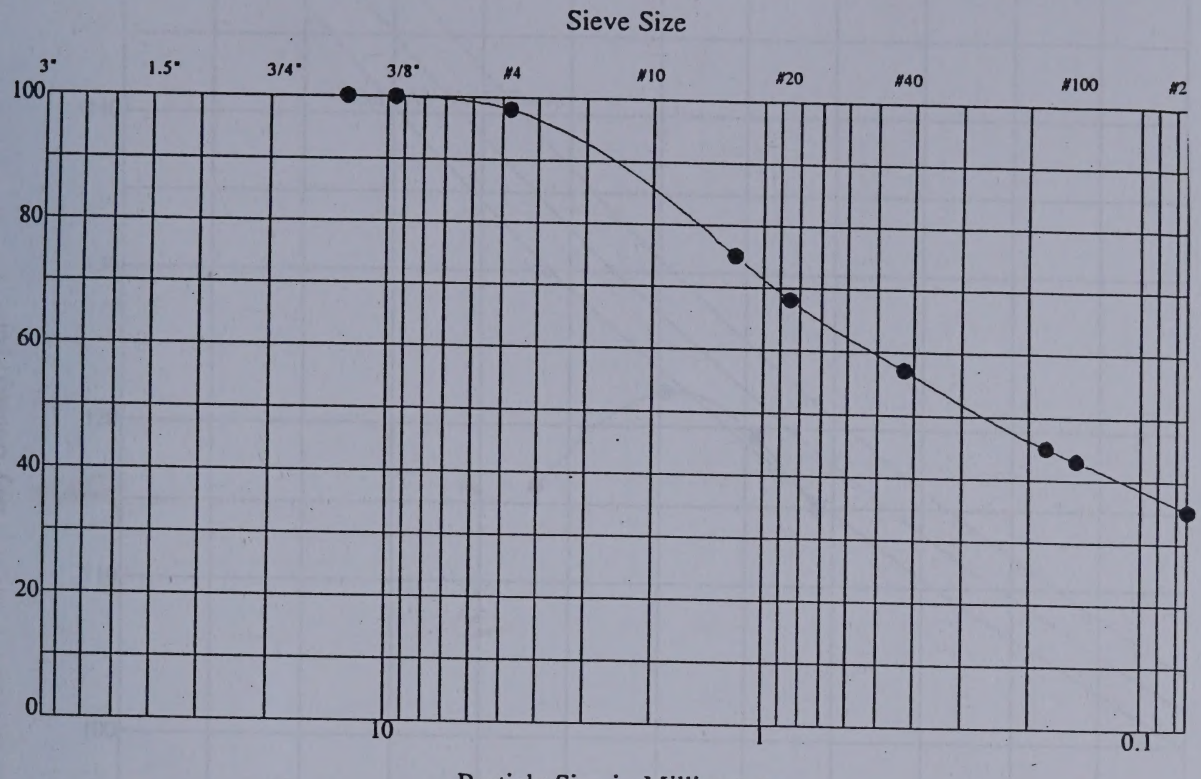
Liquid Limit:	28.6
Plastic Limit:	21.3
Plasticity Index:	7.2
Classification:	SC
Moisture Content =	13.1

July 12, 1996

LAO/Clark - Butte, Montana



Sieve Analysis (ASTM C 136, C 117)



Gravel		Sand		
Coarse	Fine	Coarse	Medium	Fine

Percent Passing U.S. Standard Sieve Size

3"	3/4"	3/8"	#4	#10	#20	#40	#50	#100	#200
100	100	100	98	84	68	57	52	43	35.1

Sample No.: 25 Lab No.: 96281 Depth: ~~Lift 2~~ LIFT 3
Location: CTTP4

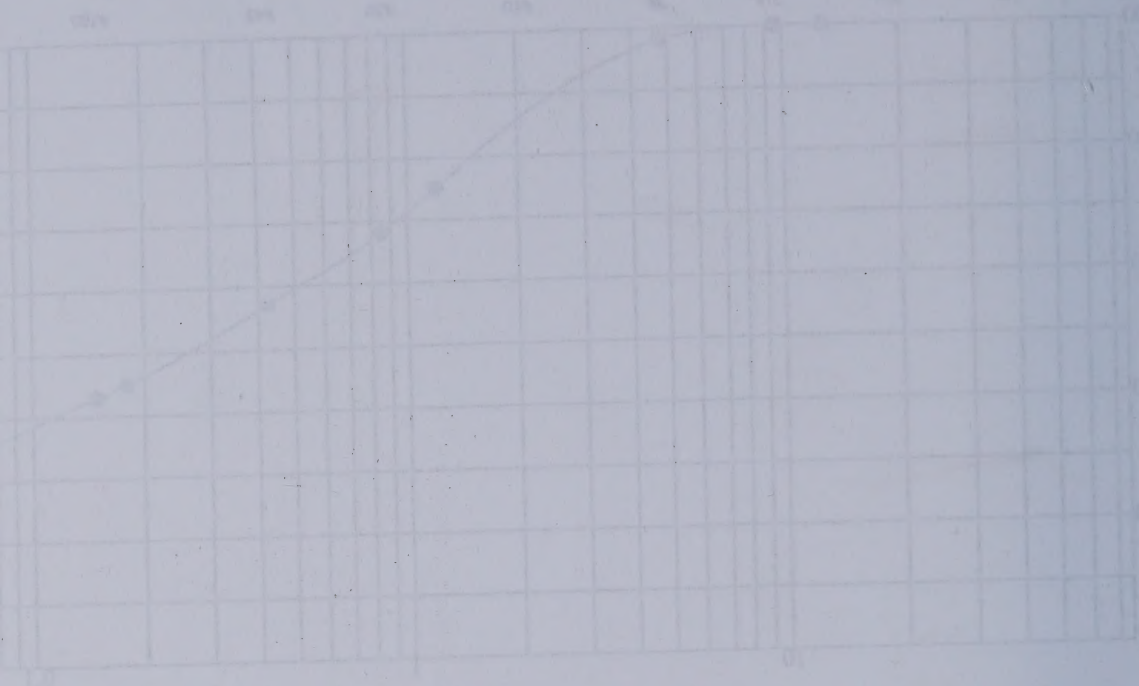
Percent Gravel: 2.0
Percent Sand: 62.9
Percent Silt + Clay: 35.1

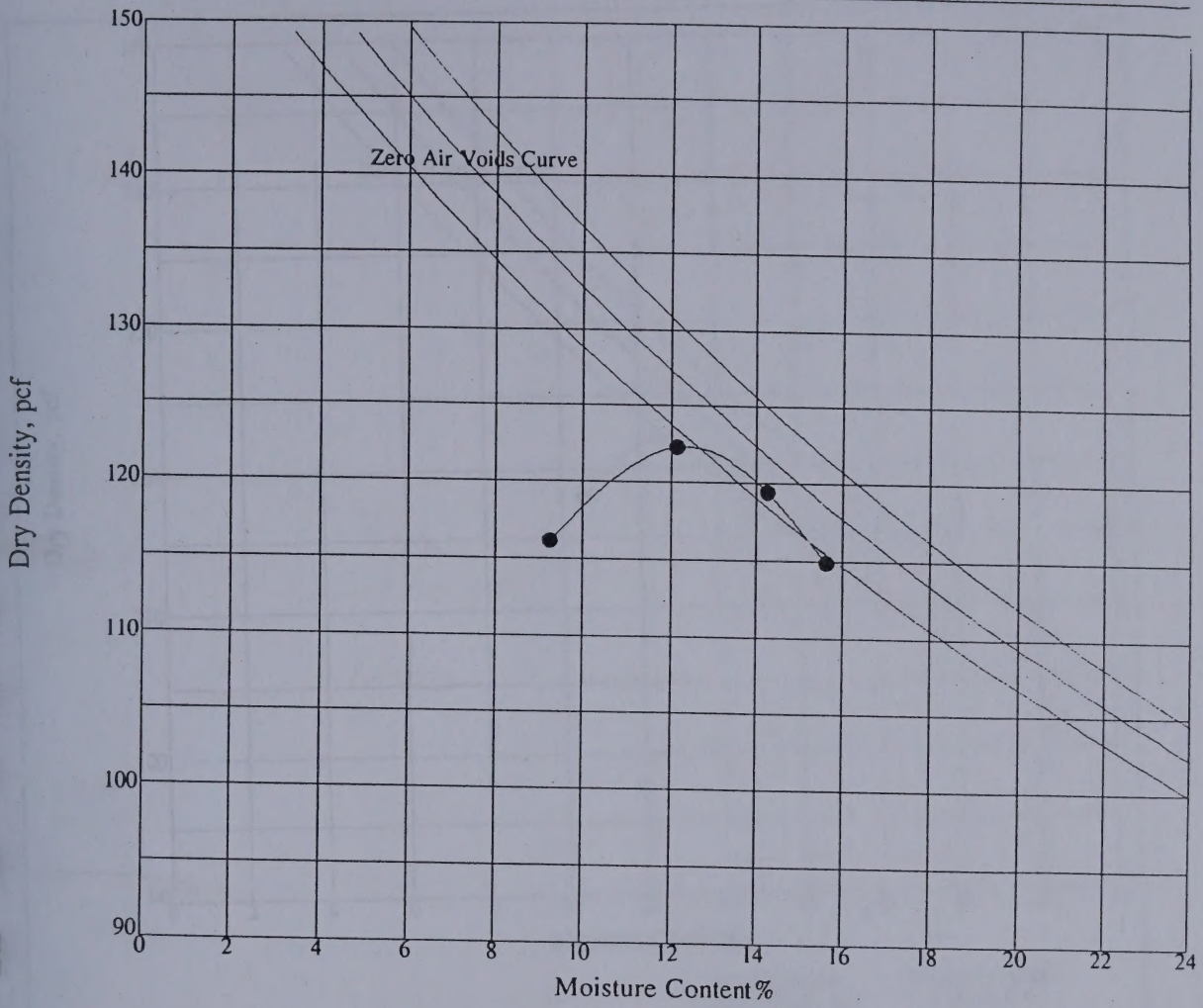
Atterberg Limits (ASTM D 4318)
Moisture Content (ASTM D 2216)

Liquid Limit:	28.0
Plastic Limit:	21.1
Plasticity Index:	6.9
Classification:	SC-SM
Moisture Content =	13.2

July 12, 1996

LAO/Clark - Butte, Montana





	Maximum Dry Density Weight, pcf*	Optimum Moisture Content %*
	122.0	12.5

Sample No: Hollow Silty Sand - 1 Lab: 96255 Depth: Unknown

Soil Description: CLAYEY SAND, fine- to coarse-grained, low plasticity, olive brown. (SC)
5% aggregate retained on the #4 sieve (discarded).
0% aggregate retained on the 3/8" sieve (discarded).
0% aggregate retained on the 3/4" sieve (discarded).
Sampled by BOA/PTS on 06/25/96 from Hollow Pit.

ASTM D 698-91
Procedure: A

*Density and moisture results rounded to nearest 0.5.

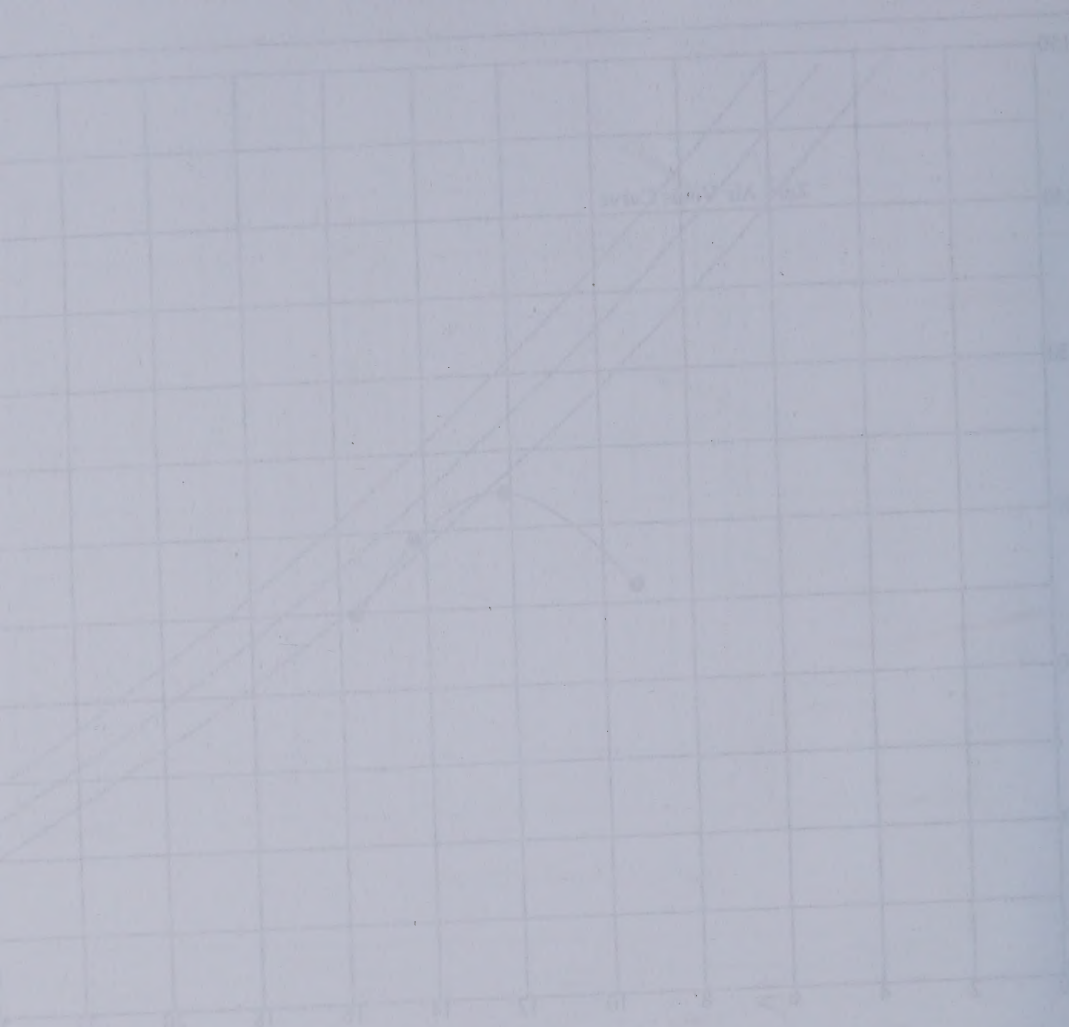
Job No:
JBX-96-057A

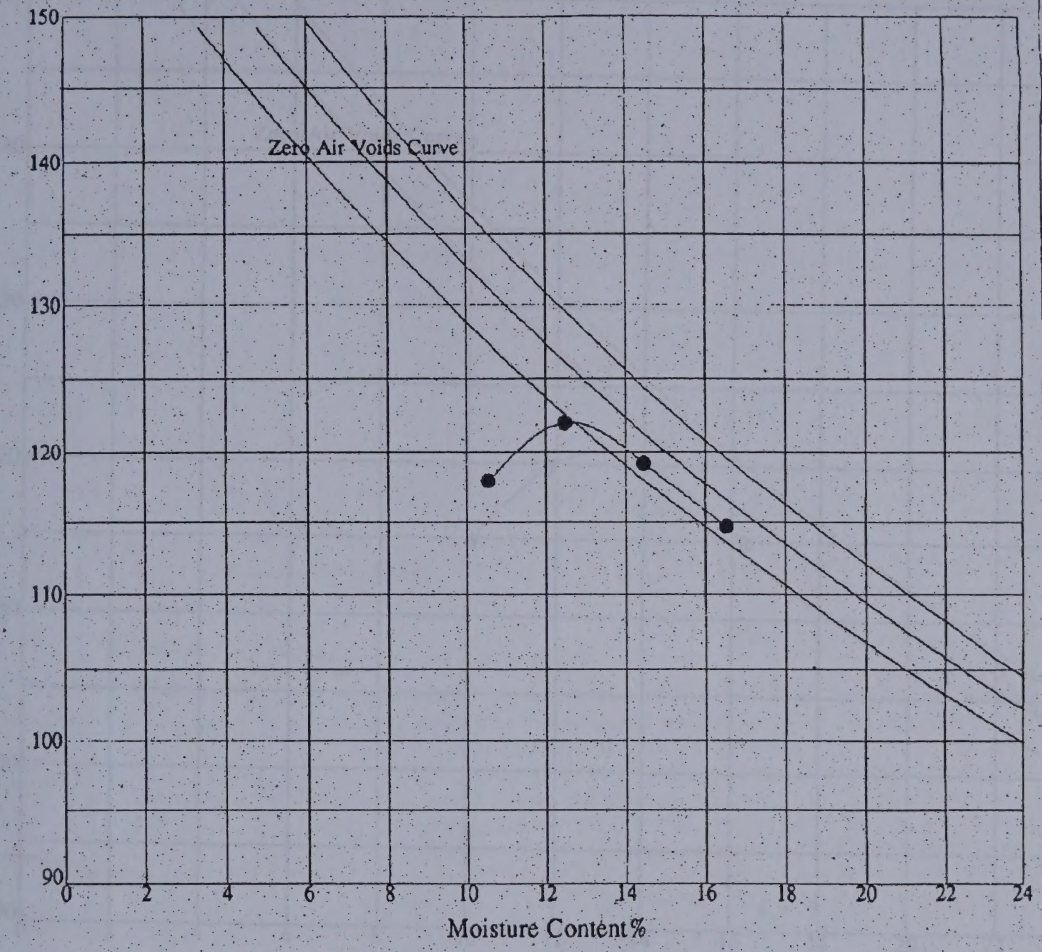
Date:
JUL 1, 1996

Laboratory Compaction Characteristics
of Soil (Proctor)
LAO/Clark
Butte, Montana

Braun Intertec Corporation

Plate
P-8





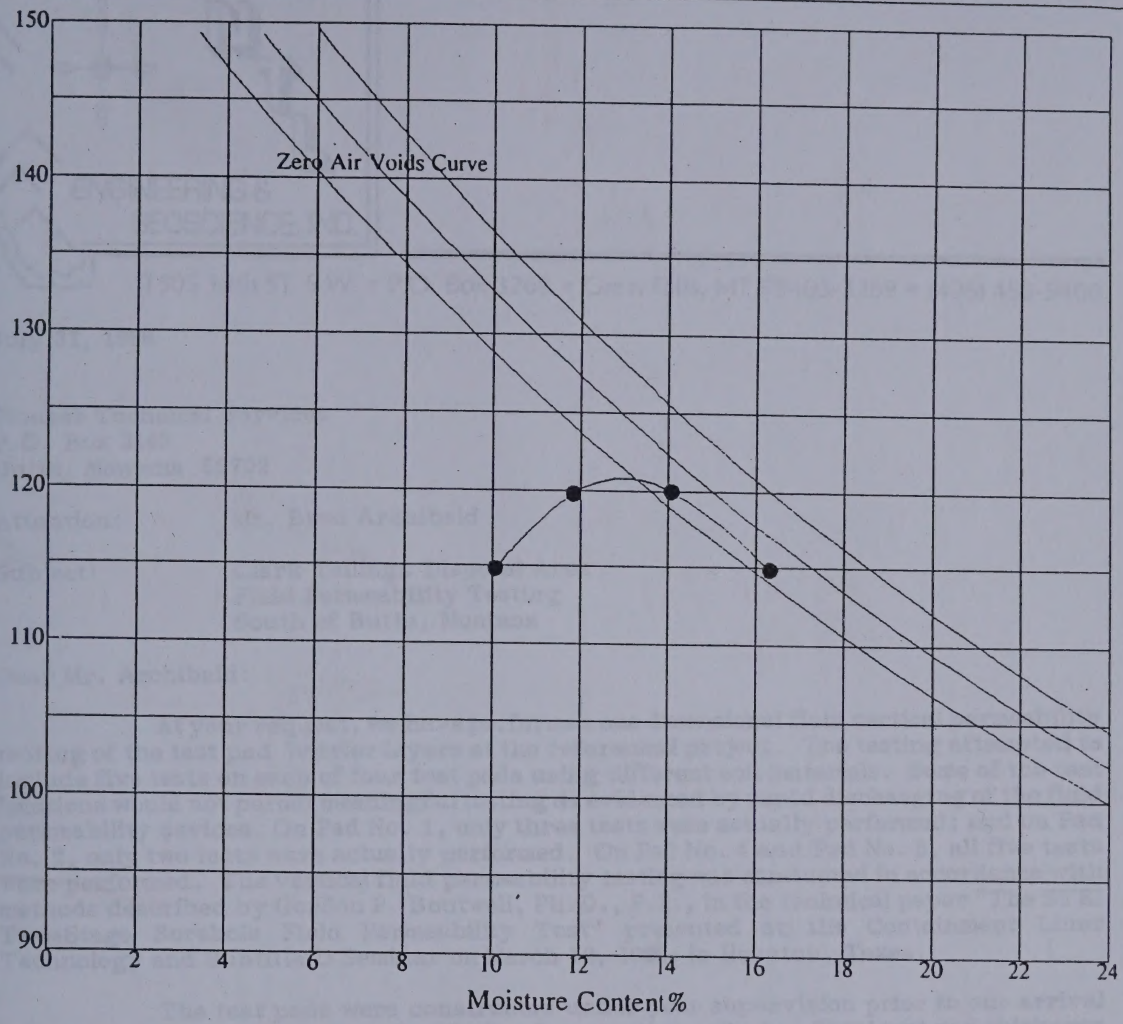
	Maximum Dry Density Weight, pcf*	Optimum Moisture Content %*
Sample No: 10 Lab: 96256 Depth: Inf. barrier layer	122.0	12.5

Soil Description: SILTY SAND, fine- to -coarse-grained, slightly plastic, reddish brown. (SM)
5% aggregate retained on the #4 sieve (discarded).
1% aggregate retained on the 3/8" sieve (discarded).
0% aggregate retained on the 3/4" sieve (discarded).
Sampled by BOA/PTS on 07/01/96 from Hollow Pit, Silt sand-2

ASTM D 698-91
Procedure: A

*Density and moisture results rounded to nearest 0.5

Job No:	Laboratory Compaction Characteristics of Soil (Proctor) LAO/Clark Butte, Montana	Plate
BJBX-96-057A		
Appr: VFK		P-9
Date: JUL 3, 1996	Braun Intertec Corporation	



Maximum Dry Density Weight, pcf*	Optimum Moisture Content %*
120.0	13.0

ample No: 25 Lab: 96281 Depth: Lift 2

oil Description: SILTY CLAYEY SAND, fine- to coarse-grained, low plasticity, light brown (SC-SM).
2% aggregate retained on the #4 sieve (discarded).
0.1% aggregate retained on the 3/8" sieve (discarded).
0% aggregate retained on the 3/4" sieve.
Sampled by BOA/PTS on 7/3/96 from CTTP4, Lift 3.

STM D 698-91
rocedure: A

*Density and moisture results rounded to nearest 0.5.

ob No: JBX-96-057A
or: WFL
ate: UL 12, 1996

Laboratory Compaction Characteristics of Soil (Proctor)
LAO/Clark
Butte, Montana

Braun Intertec Corporation

Plate
P-16

ENGINEERING & GEOSCIENCE, INC.
1505 14th ST. S.W. • P.O. Box 3269 • Great Falls, MT 59403-3269 • (406) 453-5400

July 31, 1996

Pioneer Technical Services
P.O. Box 3445
Butte, Montana 59702

Attention: Mr. Brad Archibald

Subject: Clark Tailings Disposal Area
Field Permeability Testing
South of Butte, Montana

Dear Mr. Archibald:

At your request, we have performed one dimensional field vertical permeability testing of the test pad barrier layers at the referenced project. The testing attempted to include five tests on each of four test pads using different soil materials. Some of the test locations would not permit meaningful testing as evidenced by rapid discharging of the field permeability devices. On Pad No. 1, only three tests were actually performed; and on Pad No. 2, only two tests were actually performed. On Pad No. 4 and Pad No. 5, all five tests were performed. The vertical field permeability testing was conducted in accordance with methods described by Gordon P. Boutwell, Ph.D., P.E., in the technical paper "The STEI Two-Stage Borehole Field Permeability Test" presented at the Containment Liner Technology and Subtitle D Seminar on March 12, 1992, in Houston, Texas.

The test pads were constructed under your supervision prior to our arrival on-site. The devices were installed by hand excavation methods. Total test pad thickness was assumed to be the planned 18 inches. The field permeability test results are summarized on the following page, along with sand cone field density test results for Pad No. 1 and Pad No. 4.

The field permeability tests indicate comfortable compliance with the specification requirement for a coefficient of permeability of $1x10^{-5}$ cm/sec or less. Please call if you have questions.

Sincerely,

Kenneth D. Munski, P.E.
Sr. Materials Engineer

Gary A. Quinn, P.E.
Sr. Geotechnical Engineer

KDM/GAQ/tp

FIELD PERMEABILITY TESTS
CLARK TAILINGS DISPOSAL AREA
SOUTH OF BUTTE, MONTANA

TEST PAD NO. 1

Pad No.-Test No. Identification	Test Location	Casing Embedment (In.)	Total Pad Depth (In.)	Field Vertical Permeability, k_v (cm/sec)*	Field Dry Density (lb/ft^3)**	Field Moisture Content, (%)**
1-1	6' S. & 16' W. NE Pad Corner	10	18	N/A***	98.8	23.9
1-2	4' S. & 11' E. of NW Pad Corner	10	18	3.9×10^{-7}	---	---
1-3	7' N. & 6' E. of SW Pad Corner	10	18	2.7×10^{-7}	---	---
1-4	5' N. & 24' W. of SE Pad Corner	10	18	7.2×10^{-7}	---	---
1-5	14' S. & 3' W. of NE Pad Corner	10	18	N/A***	103.2	20.8

*Stage I testing with temperature/viscosity correction. Average of all tests; see attached statistical summary.
**Sand cone field density result.
***Test could not be performed due to rapid discharge of field permeameter.

FIELD PERMEABILITY TESTS
CLARK TAILINGS DISPOSAL AREA
SOUTH OF BUTTE, MONTANA

TEST PAD NO. 2

Pad No.-Test No. Identification	Test Location	Casing Embedment (In.)	Total Pad Depth (In.)	Field Vertical Permeability, k_v (cm/sec)*
2-1	5' S. & 5' E. of NW Pad Corner	10	18	N/A***
2-2	11' S. & 10' E. of NW Pad Corner	10	18	2.6×10^{-7}
2-3	10' S. & 18' E. of NW Pad Corner	10	18	1.0×10^{-6}****
2-4	6' S. & 22' E. of NW Pad Corner	10	18	N/A***
2-5	10' S. & 28' E. of NW Pad Corner	10	18	N/A***

*Stage I testing with temperature/viscosity correction. Average of all tests; see attached statistical summary.
***Test could not be performed due to rapid discharge of field permeameter.
****Limited test time (3 hr) before rapid discharge terminated the test.

FIELD PERMEABILITY TESTS
CLARK TAILINGS DISPOSAL AREA
SOUTH OF BUTTE, MONTANA

TEST PAD NO. 4

(Note to reviewer: Pad No. 3 was dropped, not tested.)

Pad No.-Test No. Identification	Test Location	Casing Embedment (In.)	Total Pad Depth (In.)	Field Vertical Permeability, k_v (cm/sec)*	Field Dry Density (lb/ft^3)**	Field Moisture Content, (%)**
4-1	7' S. & 14' E. of NW Pad Corner	10	18	1.6×10^{-7}	---	---
4-2	6' S. & 6' E. of NW Pad Corner	10	18	1.4×10^{-7}	128.0	11.0
4-3	4' N. & 19' W. of SE Pad Corner	10	18	1.6×10^{-7}	---	---
4-4	3' S. & 6' W. of NE Pad Corner	10	18	5.2×10^{-7}	---	---
4-5	4' W. & 6' W. of SE Pad Corner	10	18	4.3×10^{-7}	118.3	11.3

*Stage I testing with temperature/viscosity correction. Average of all tests; see attached statistical summary.
**Sand cone field density result.

FIELD PERMEABILITY TESTS
CLARK TAILINGS DISPOSAL AREA
SOUTH OF BUTTE, MONTANA

TEST PAD NO. 5

Pad No.-Test No. Identification	Casing Test Location	Total Embedment (In.)	Field Vertical Pad Depth (In.)	Permeability, k_v (cm/sec)*
5-1	6' S. & 8' E. of NW Pad Corner	10	18	6.8×10^{-7}
5-2	9' S. & 15' E. of NW Pad Corner	10	18	1.3×10^{-7}
5-3	6' S. & 18' E. of NW Pad Corner	10	18	1.5×10^{-7}
5-4	11' S. & 22' E. of NW Pad Corner	10	18	4.2×10^{-7}
5-5	6' S. & 27' E. of NW Pad Corner	10	18	1.4×10^{-7}

*Stage I testing with temperature/viscosity correction. Average of all tests; see attached statistical summary.

FIELD PERMEABILITY STATISTICS
Clark Tailings Disposal Area

Pad 1 Statistics

	Well 2	Well 3	Well 4
Mean	3.92E-07	2.72E-07	7.97E-07
Standard Error	5.52E-08	1.28E-08	1.99E-07
Median	3.12E-07	2.68E-07	4.47E-07
Standard Deviation	2.21E-07	5.13E-08	7.97E-07
Variance	4.88E-14	2.63E-15	6.35E-13
Skewness	2.545943	0.299697	2.620354
Range	8.61E-07	1.81E-07	3.09E-06
Minimum	2.41E-07	1.95E-07	3.61E-07
Maximum	1.1E-06	3.77E-07	3.09E-06
Sum	6.27E-06	4.35E-06	9.57E-06
Count	16	16	12

Pad 2 Statistics

	Well 2	Well 3
Mean	2.56E-07	1E-06
Standard Error	1.66E-08	4.62E-08
Median	2.33E-07	1E-06
Standard Deviation	5.98E-08	1.66E-07
Variance	3.58E-15	2.77E-14
Skewness	-0.57008	2.253732
Range	3.52E-07	1.12E-06
Minimum	1.44E-07	8.84E-07
Maximum	3.52E-07	1.12E-06
Sum	2.56E-06	2E-06
Count	10	2

Pad 4 Statistics

	Well 1	Well 2	Well 3	Well 4	Well 5
Mean	1.61E-07	1.36E-07	1.63E-07	5.24E-07	4.25E-07
Standard Error	1.12E-08	7.23E-09	7.85E-09	3.04E-08	1.42E-08
Median	1.36E-07	1.28E-07	1.51E-07	5.4E-07	4.31E-07
Standard Deviation	4.17E-08	2.7E-08	2.94E-08	9.63E-08	5.31E-08
Variance	1.74E-15	7.31E-16	8.63E-16	9.27E-15	2.82E-15
Skewness	0.683664	1.291359	1.121636	-0.41799	-2.7289
Range	1.09E-07	1.04E-07	1.07E-07	3.11E-07	4.97E-07
Minimum	1.16E-07	1.01E-07	1.24E-07	3.51E-07	3.31E-07
Maximum	2.25E-07	2.05E-07	2.31E-07	6.63E-07	4.97E-07
Sum	2.25E-06	1.91E-06	2.28E-06	5.24E-06	5.53E-06
Count	14	14	14	10	13

Pad 5 Statistics

	Well 1	Well 2	Well 3	Well 4	Well 5
Mean	6.78E-07	1.29E-07	1.52E-07	4.18E-07	1.37E-07
Standard Error	4.03E-08	1.64E-08	6.08E-09	1.78E-08	3.02E-09
Median	6.31E-07	1.19E-07	1.37E-07	3.98E-07	1.4E-07
Standard Deviation	1.45E-07	5.91E-08	2.28E-08	6.43E-08	1.09E-08
Variance	2.12E-14	3.49E-15	5.18E-16	4.14E-15	1.19E-16
Skewness	-1.2467	3.441922	-0.46833	0.222949	0.057463
Range	8.63E-07	2.29E-07	2.01E-07	1.9E-07	3.13E-08
Minimum	4.82E-07	9.45E-08	1.31E-07	3.33E-07	1.21E-07
Maximum	8.63E-07	3.24E-07	2.01E-07	5.23E-07	1.53E-07
Sum	7.45E-06	1.68E-06	1.37E-06	5.43E-06	1.78E-06
Count	11	13	9	13	13

APPENDIX C

Construction-Phase Testing Results

received
6/6/97

MATERIALS LABORATORY
TEST RESULTS TRANSMITTAL
COVER LETTER

MSE HKM ENGINEERING
MSE-HKM, Inc.
Materials Testing Laboratory
220 North Alaska Street
P.O. BOX 3588
Butte, MT 50702
(406)723-8213
Lab (406)723-3145
Lab Fax (406)723-3767

Date : 6/4/97

To : Pioneer Technical Services
105 North Excelsior
Butte MT

Attn. : Brad Archibald

Re. : Butte Silver Bow Landfill Project no. :

Dear : Mr. Archibald

Summarized on the following pages are results of tests on a sample of material delivered to our Laboratory by your personnel.
Thank you.

Transmitted herewith are the following test results.

Laboratory Analyses :	**Field Analyses :**
(x) Sieve Analysis	( ) Nuclear Compaction Test
(x) Atterberg Limits	( ) Sandcone Compaction Test
(x) Moisture Density Curve	( ) Concrete Field Test
(x) Natural Moisture	( ) Concrete Cores
( ) Bearing Ratio	( ) Asphalt Cores
( ) Concrete Compressive Strength	( ) Percolation Test
( ) Asphalt Extraction	( ) Mortar Test
( ) Asphalt Marshall Test	( ) Grout Test
(x) #NG-22 Natural Moisture = 9.2%	( ) _____
(x) #NG-27 Natural Moisture = 9.9%	( ) _____

If there are any questions or concerns, please contact me at your convenience.

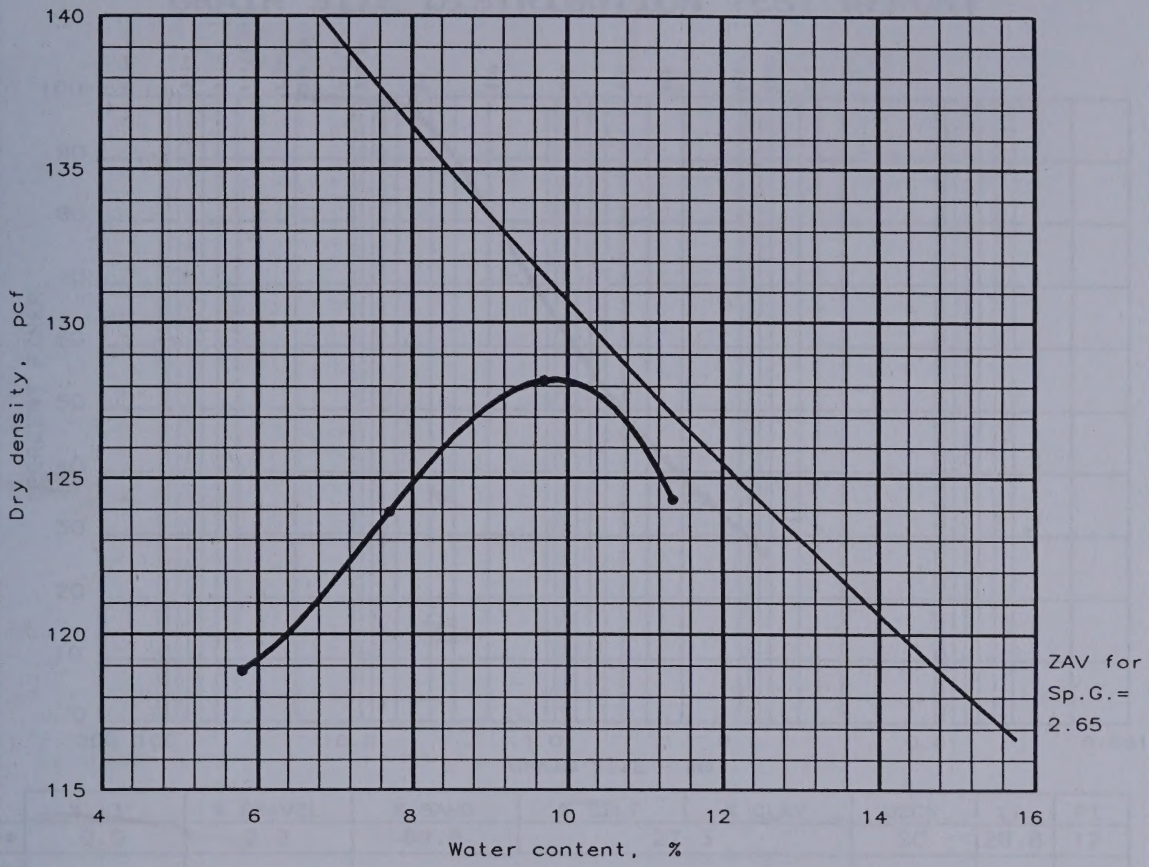
Sincerely,

MSE - HKM, INC.

Lyle Gibson for

James M. Jozovich
Laboratory Manager

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard

Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	SC	NT	7.9 %	NT	29	12		27.3 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 128.2 pcf	128.2 pcf	Clayey Sand
Optimum moisture = 9.8 %	9.8 %	SC

Project No.:

Project: Butte Silver Bow - Landfill

Location: Station 3+30

130' East

Date: June 4, 1997

Remarks:

DATE SAMPLED:5/30/97

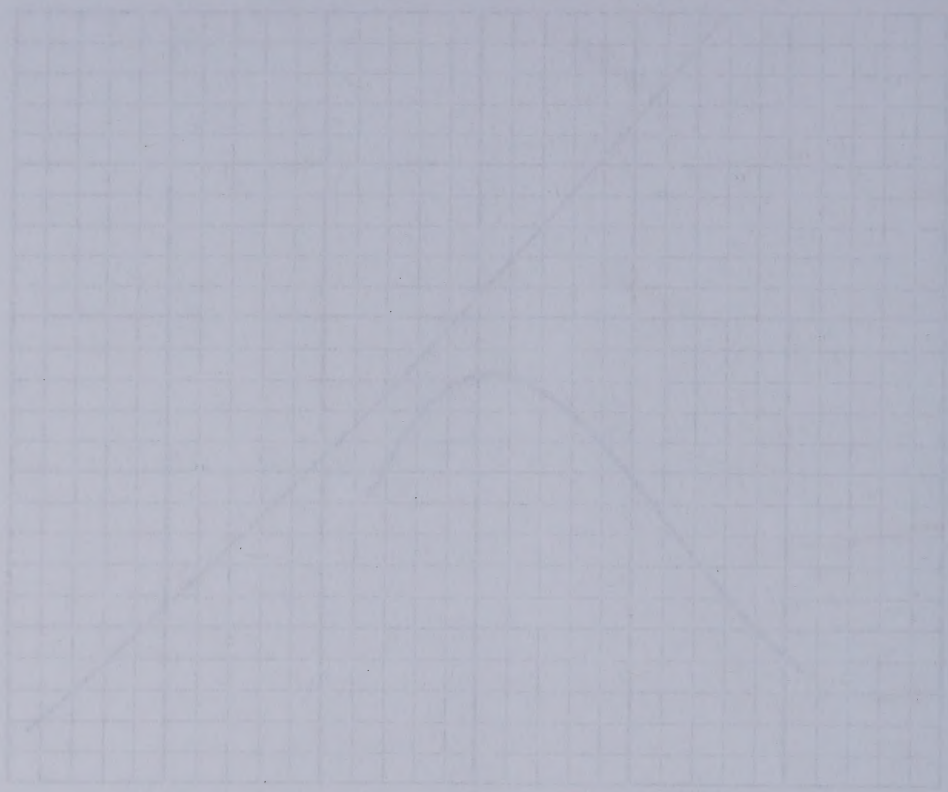
DATE TESTED :6/3/97

Lab ID:609

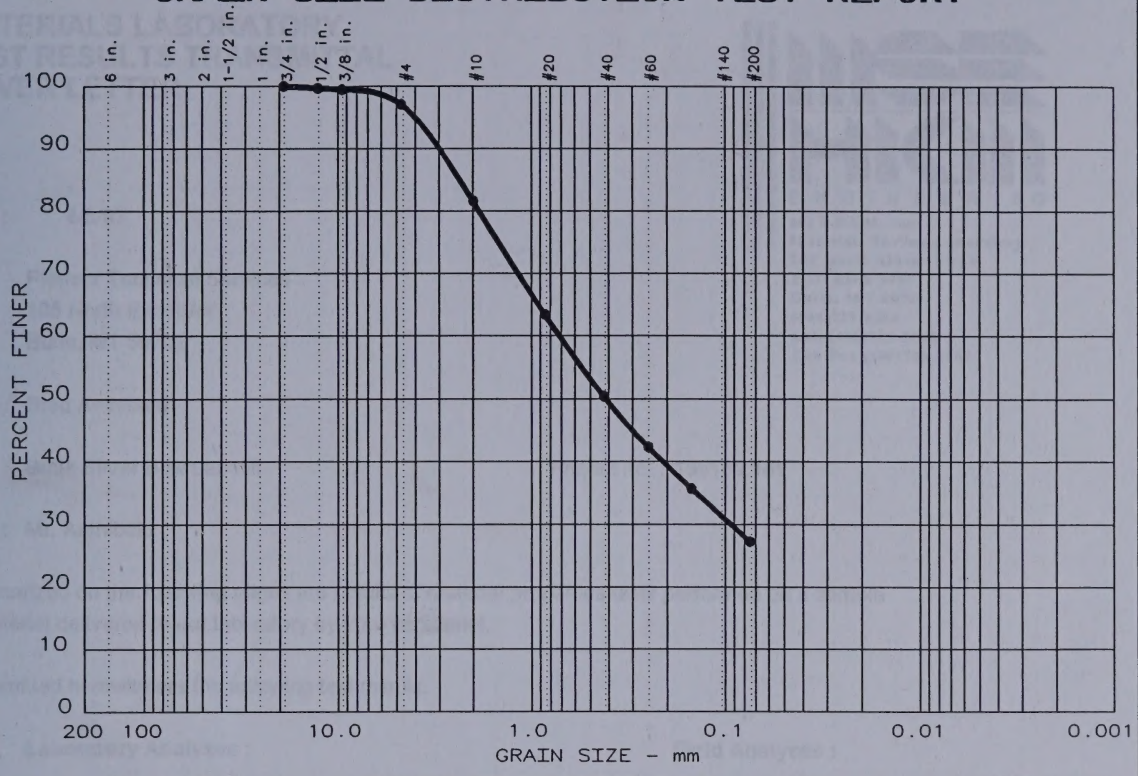
MOISTURE-DENSITY RELATIONSHIP TEST

MSE-HKM, INC.

Fig. No. 609



GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	0.0	2.9	69.8	27.3		SC	28.8	12

SIEVE inches size	PERCENT FINER ●
0.75	100.0
0.5	99.7
0.375	99.5
GRAIN SIZE	
D_{60}	0.716
D_{30}	
D_{10}	
COEFFICIENTS	
C_c	
C_u	

SIEVE number size	PERCENT FINER ●
4	97.1
10	81.6
20	63.4
40	50.4
60	42.3
100	35.7
200	27.3

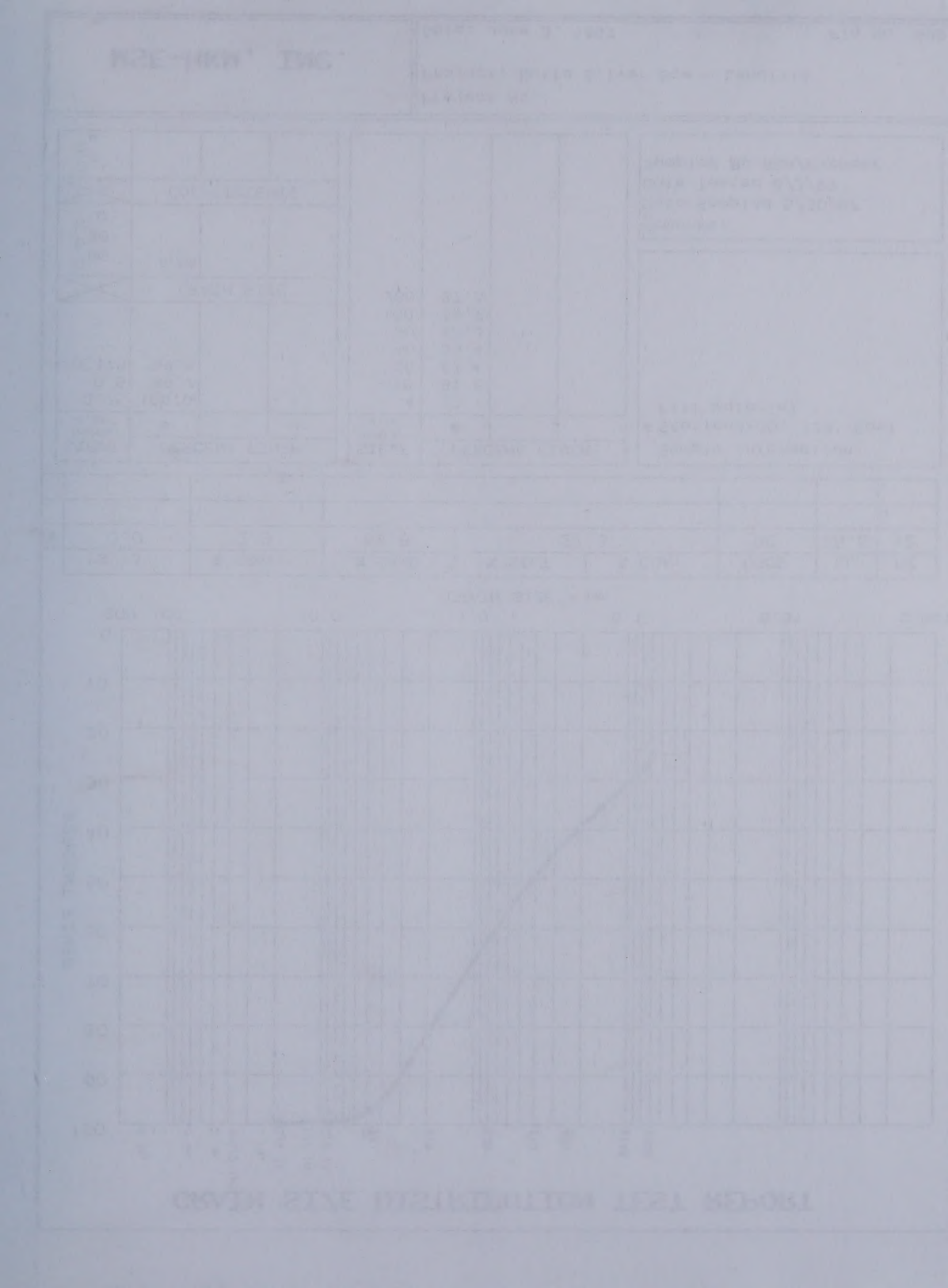
Sample information:
● Station3+30; 130' East
Fill Material

Remarks:
Date Sampled 5/30/97
Date Tested 6/3/97
Sampled By BSA/Pioneer

MSE-HKM, INC.

Project No.:
Project: Butte Silver Bow - Landfill

Date: June 3, 1997 Fig.No: 609



MATERIALS LABORATORY
TEST RESULTS TRANSMITTAL
COVER LETTER

MSE HKM ENGINEERING
MS E-HKM, Inc.
Materials Testing Laboratory
220 North Alaska Street
P.O. BOX 3588
Butte, MT 50702
(406)723-8213
Lab (406)723-3145
Lab Fax (406)723-3767

Date : 6/5/97

To : Pioneer Technical Services
105 North Excelsior
Butte, MT 50702

Attn. : Brad Archibald

Re. : Butte Silver Bow Landfill Project no. : 18a149.101

Dear : Mr. Archibald

Summarized on the following pages are results of material properties tests performed on a sample of material delivered to our laboratory by your personnel.

Transmitted herewith are the following test results.

Laboratory Analyses :	**Field Analyses :**
(x) Sieve Analysis	( ) Nuclear Compaction Test
(x) Atterberg Limits	( ) Sandcone Compaction Test
(x) Moisture Density Curve	( ) Concrete Field Test
(x) Natural Moisture	( ) Concrete Cores
( ) Bearing Ratio	( ) Asphalt Cores
( ) Concrete Compressive Strength	( ) Percolation Test
( ) Asphalt Extraction	( ) Mortar Test
( ) Asphalt Marshall Test	( ) Grout Test
( ) **#NG 44 Natural Moisture= 8.7%**	( ) _____
( ) **#NG 48 Natural Moisture= 9.6%**	( ) _____

If there are any questions or concerns, please contact me at your convenience.

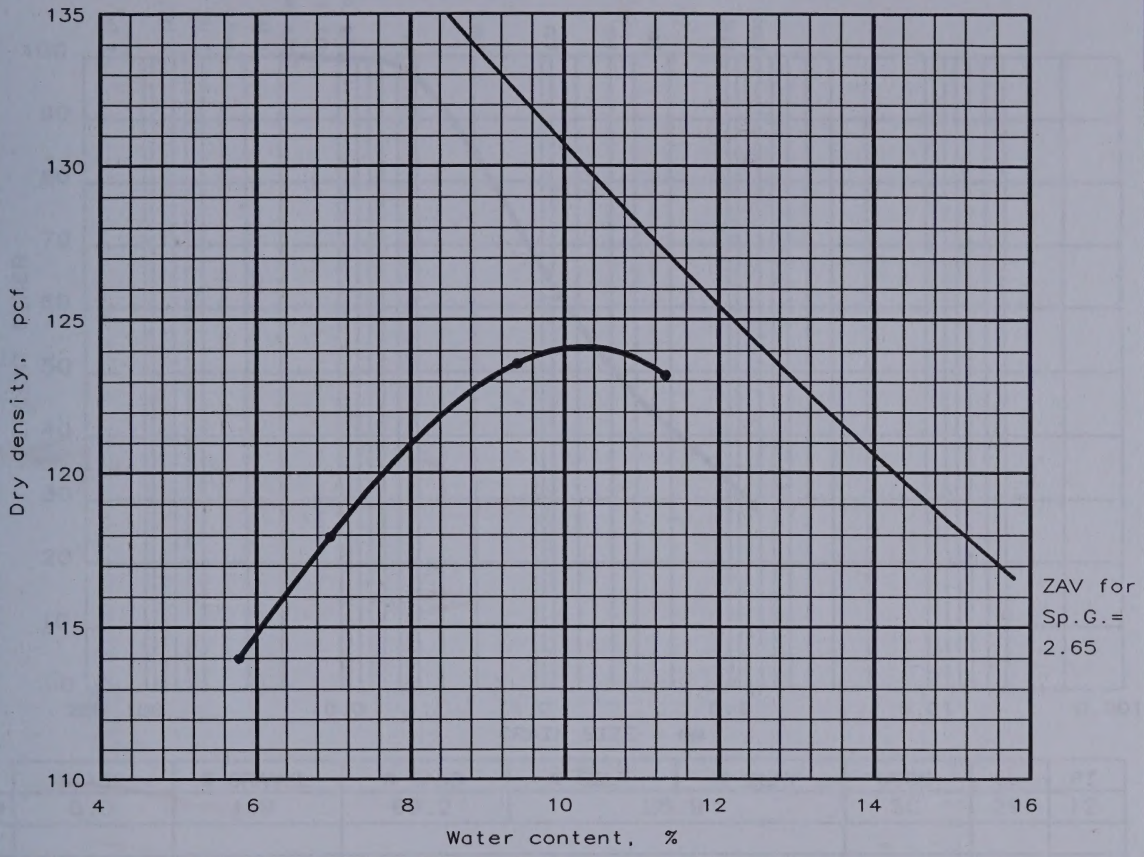
Sincerely,

MSE - HKM, INC.

Kurt Gibson for

James M. Jozovich
Laboratory Manager

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard

Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	SC	NT	11.0 %	2.65	29	12		28.9 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 124.1 pcf	124.1 pcf	Clayey Sand
Optimum moisture = 10.3 %	10.3 %	SC

Project No.: 18a149.101

Project: Butte Silver Bow - Landfill

Location: BSB Landfill

Bag Sample

Date: June 9, 1997

Remarks:

Date Sampled: 6/5/97

DATE TESTED :6/6/97

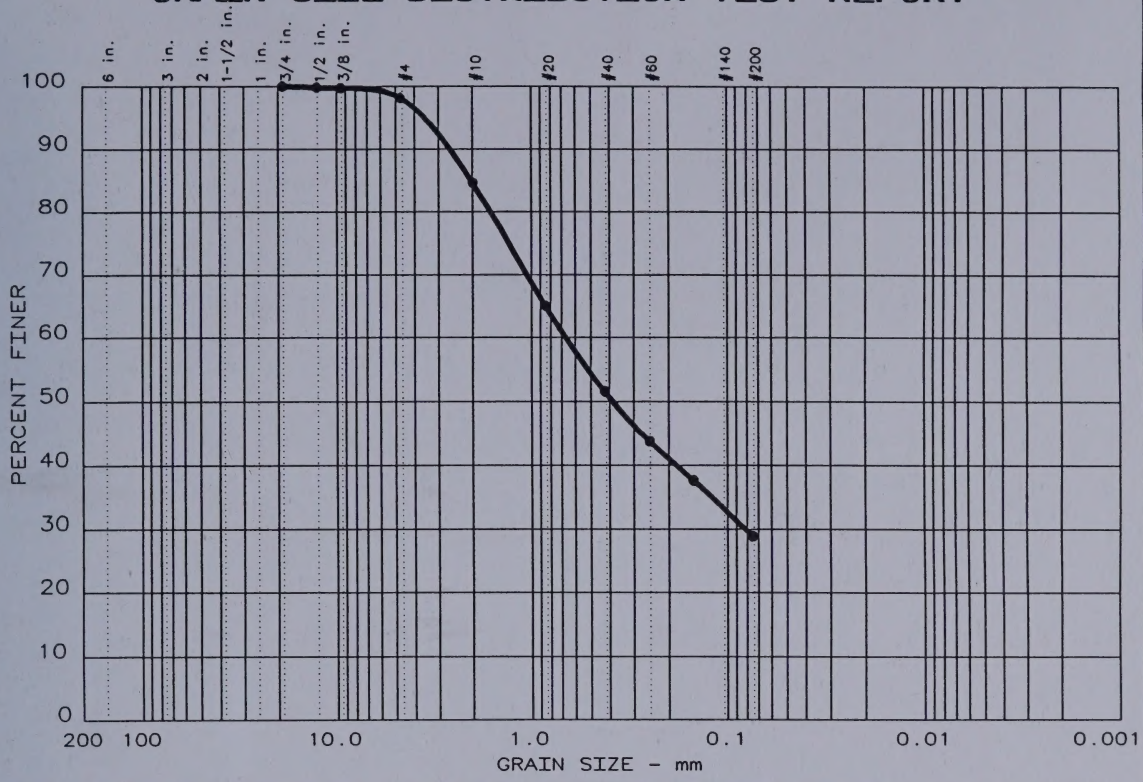
Lab ID:613

MOISTURE-DENSITY RELATIONSHIP TEST

MSE-HKM, INC.

Fig. No. 613

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	0.0	1.9	69.2	28.9		SC	29	12

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.5	99.8		
0.375	99.7		
GRAIN SIZE			
D_{60}	0.668		
D_{30}			
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	98.1		
10	84.7		
20	65.1		
40	51.6		
60	43.8		
100	37.6		
200	28.9		

Sample information:
● Not Reported
Bag Sample
LAB # 613

Remarks:
Date Sampled 6/5/97
Date Tested 6/6/97
Sampled By BSA/Pioneer

MSE-HKM, INC.

Project No.: 18a149.101
Project: Butte Silver Bow Landfill
Date: June 9, 1997
Fig.No: 613

APPENDIX D

Compaction Testing Results

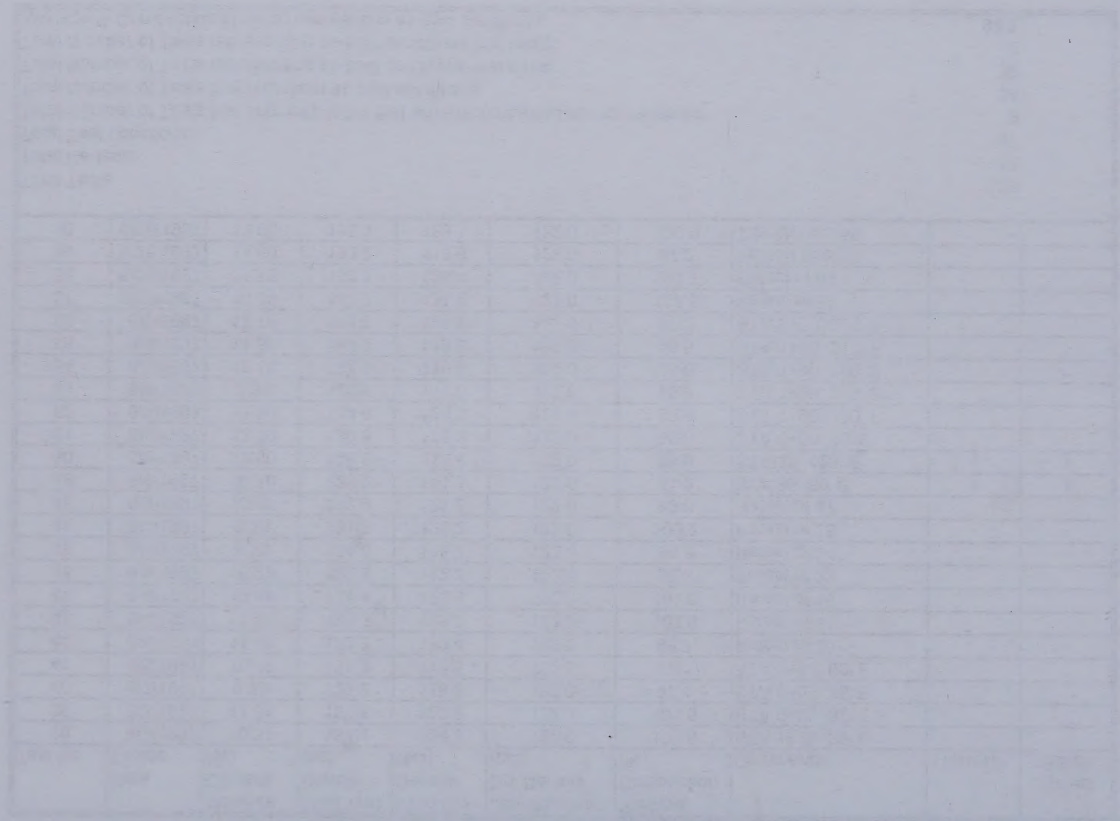
OLD SILVER BOW LANDFILL CLOSURE
FIELD DENSITY TEST SUMMARY

Test No.	Date Tested	Moisture Content (%)	Field Wet Density (pcf)	Field Dry Density (pcf)	Lab Maximum Dry Density (pcf)	Relative Compaction (%)	Comments	Retest?	Retest Pass?
1	5/22/1997	10.80	134.5	123.7	122.0	101.4	STA 4+13, 36' E		
2	5/22/1997	12.00	135.2	123.2	122.0	101.0	STA 4+60, 30' E		
3	5/22/1997	9.60	114.6	105.0	122.0	86.1	STA 4+40, 120' E	y	n
4	5/22/1997	11.40	125.6	114.2	122.0	93.6	STA 4+90, 90' E	y	y
5	5/22/1997	11.60	128.4	116.7	122.0	95.7	STA 5+50, 75' E		
6	5/23/1997	10.80	124.9	112.8	122.0	92.5	not noted	n	
7	5/28/1997	14.50	131.9	115.2	122.0	94.4	STA 6+50, 45' E	n	
8	5/28/1997	14.00	135.5	118.8	122.0	97.4	STA 6+50, 90' E		
9	5/28/1997	12.35	132.3	117.8	122.0	96.6	STA 6+50, 150' E		
10	5/28/1997	9.80	120.6	109.8	122.0	90.0	STA 6+30, 210' E	y	y
11	5/28/1997	11.65	129.9	116.4	122.0	95.4	STA 5+50, 210' E		
12	5/28/1997	7.90	124.8	115.7	122.0	94.8	STA 5+00, 180' E	n	
13	5/28/1997	12.20	130.3	116.2	122.0	95.3	STA 4+50, 150' E		
14	5/28/1997	14.50	131.7	115.1	122.0	94.3	STA 3+90, 36' E	n	
15	5/28/1997	14.70	128.8	112.3	122.0	92.1	STA 4+55, 25' E	y	y
16	5/28/1997	15.80	130.0	112.3	122.0	92.1	STA 5+15, 40' E	y	y
17	5/30/1997	17.70	136.7	118.9	122.0	97.5	Retest of 15		
18	5/30/1997	16.50	134.5	118.0	122.0	96.7	Retest of 16		
19	5/30/1997	13.20	127.6	115.4	122.0	94.6	Retest of 3		
20	5/30/1997	11.30	124.1	112.8	122.0	92.6	STA 5+83, 120' E	y	y
21	5/30/1997				122.0		no test		
22	6/2/1997	7.40	125.8	117.2	122.0	96.0	STA 1+00, 53' E		
23	6/2/1997	10.80	122.9	111.0	122.0	90.9	STA 1+00, 88' E	y	n
24	6/2/1997	7.75	119.0	110.5	122.0	90.5	STA 1+29, 60' E	y	n
25	6/2/1997	15.10	126.3	109.7	122.0	89.9	STA 3+17, 81' E	y	y
26	6/2/1997	12.01	136.4	121.8	122.0	99.8	STA 2+83, 81' E		
27	6/2/1997	11.03	125.2	112.7	122.0	92.4	STA 2+45, 78' E	y	y
28	6/2/1997	14.97	131.6	114.5	122.0	94.0	STA 1+60, 65' E	n	
29	6/2/1997	10.58	128.8	116.5	122.0	95.5	STA 0+96, 90' E		
30	6/3/1997	9.05	133.2	122.1	122.0	100.1	STA 2+00, 50' E		
31	6/3/1997	7.75	121.8	113.0	122.0	93.2	STA 2+10, 90' E	n	
32	6/3/1997	10.24	130.3	118.2	122.0	96.9	STA 1+78, 90' E		
33	6/3/1997	12.21	135.7	121.0	122.0	99.0	STA 1+25, 100' E		
34	6/3/1997	10.86	128.3	115.7	122.0	94.8	STA 1+05, 120' E	n	
35	6/3/1997	9.63	119.9	109.6	122.0	89.8	STA 0+75, 90' E	n	
36	6/3/1997	8.59	124.6	114.8	122.0	94.1	STA 1+25, 80' E	n	
37	6/3/1997	9.90	128.0	116.4	122.0	95.4	STA 1+78, 60' E		

OLD SILVER BOW LANDFILL CLOSURE
FIELD DENSITY TEST SUMMARY

Test No.	Date Tested	Moisture Content (%)	Field Wet Density (pcf)	Field Dry Density (pcf)	Lab Maximum Dry Density (pcf)	Relative Compaction (%)	Comments	Retest?	Retest Pass?
38	6/3/1997	10.31	137.1	124.3	122.0	101.9	STA 1+38, 35' E		
39	6/3/1997	11.31	137.6	123.8	122.0	101.5	STA 0+90, 35' E		
40	6/3/1997	9.22	129.8	118.8	122.0	97.4	STA 0+50, 35' E		
41	6/3/1997	10.77	131.3	118.5	122.0	97.1	STA 0+50, 60' E		
42	6/4/1997	11.40	132.3	120.4	122.0	98.7	Retest of 20		
43	6/4/1997	11.00	136.2	125.2	122.0	102.6	Retest of 4		
44	6/4/1997	10.50	134.4	123.9	122.0	101.6	Retest of 10		
45	6/4/1997	10.20	122.8	112.6	122.0	92.3	Retest of 23		
46	6/4/1997	8.90	124.6	115.7	122.0	94.8	Retest of 24		
47	6/4/1997	9.20	131.3	122.2	122.0	100.2	Retest of 25		
48	6/4/1997	10.20	132.0	121.8	122.0	99.8	Retest of 27		
49	6/9/1997	10.70	123.2	111.3	122.0	91.2	STA 36, 60' E	y	y
50	6/9/1997	13.50	128.6	113.4	122.0	93.0	STA 36, 120' E	y	y
51	6/9/1997	12.50	130.8	116.2	122.0	95.3	STA 0+66, 90' E		
52	6/9/1997	11.90	134.6	120.3	122.0	98.6	STA 1+00, 120' E		
53	6/9/1997	9.80	128.5	117.0	122.0	95.9	STA 1+30, 150' E		
54	6/9/1997	12.10	134.0	119.6	122.0	98.0	STA 1+00, 180' E		
55	6/9/1997	11.30	129.7	116.5	122.0	95.5	STA 1+00, 210' E		
56	6/9/1997	12.70	133.7	118.7	122.0	97.3	STA 0+70, 225' E		
57	6/25/1997	10.00	141.2	131.2	122.0	107.5	Retest of 50		
58	6/25/1997	11.70	138.1	126.4	122.0	103.7	Retest of 49		
59	6/25/1997	14.60	133.2	118.6	122.0	97.2	Trench Backfill		
60	6/25/1997	12.00	135.1	123.1	122.0	100.9	Trench Backfill		

Total Tests	59
Total Re-tests	12
Total Test Locations:	47
Total Number of Tests that originally failed that were recompacted but not re-tested:	9
Total Number of Tests that represent as-built conditions:	38
Total Number of Tests representing as-built conditions that pass:	36
Total Number of Tests representing as-built conditions that tailed:	2
Average % Compaction of tests representing as-built conditions:	98.2



Pioneer Technical Services, Inc. P.O. Box 3445 Butte, MT 59702 (406) 782-5177	**FIELD DENSITY TEST SUMMARY**	Project OLD SB LANDFILL Project No. 9503 Tests on POST 91 CAP, LIFT 1 Page 1 of 3

Test No.	Date Tested	Test Type*	Moisture Content (%)	Field Wet Density (pcf)	Field Dry Density (pcf)	Compaction Curve No.	Lab Maximum Dry Density (pcf)	Relative Compaction (%)	Specified Relative Compaction (%)	Comments
1	5/22	NG	10.8	134.5	123.7		122.0	101.4	95	~~1'E OF W EDGE~~ STA 2+13, 36'E
2	5/22	NG	12.0	135.2	123.2		122.0	101.0	95	~~STA 4+60, 30'E~~
3	5/22	NG	9.6	114.6	105.0		122.0	86.1	95	STA 4+40, 120'E
4	5/22	NG	11.4	125.6	114.2		122.0	93.6	95	STA 4+90, 90'E
5	5/22	NG	11.6	128.4	116.7		122.0	95.7	95	STA 5+50, 75'E
6	5/23	NG	10.9	124.9	112.8		122.0	92.45	95	
7	5/28	NG	14.5	131.9	115.2		122.0	94.4	95	STA 6+50, 45'E
8	5/28	NG	14.0	135.5	118.8		122.0	97.4	95	6+50, 90'E
9	5/28	NG	12.35	132.3	117.8		122.0	96.6	95	6+50, 150'E
10	5/28	NG	9.8	120.6	109.8		122.0	90.0	95	6+30, 210'E
11	5/28	NG	11.65	129.9	116.4		122.0	95.4	95	5+50, 210'E
12	5/28	NG	7.9	124.8	115.7		122.0	94.8	95	5+00, 180E
13	5/28	NG	12.2	130.3	116.2		122.0	95.3	95	4+30, 150E
14	5/28	NG	14.5	131.7	115.1		122.0	94.3	95	3+90, 36'E
15	5/28	NG	14.7	129.8	112.3		122.0	92.1	95	4+55, 25'E
16	5/28	NG	15.8	130.0	112.3		122.0	92.1	95	5+15, 40'E
17	5/30	NG	17.7	136.7	118.9			97.5	95	RETEST OF 15
18	5/30	NG	16.5	134.5	118.0		122.0	96.7	95	RETEST OF 16
19	5/30	NG	13.2	127.6	115.4			94.6		RETEST OF 3
20	5/30	NG	11.3	124.1	112.8			92.6		5+83, 120'E
21	5/30	NG								

* SC = Sandcone Density; NG = Nuclear Gauge Density Test

Pioneer Technical Services, Inc. P.O. Box 3445 Butte, MT 59702 (406) 782-5177	**FIELD DENSITY TEST SUMMARY**	Project OLD 858 Landfill Project No. 9503 Tests on Post 91 CAP Page 2 of 3

Test No.	Date Tested	Test Type*	Moisture Content (%)	Field Wet Density (pcf)	Field Dry Density (pcf)	Compaction Curve No.	Lab Maximum Dry Density (pcf)	Relative Compaction (%)	Specified Relative Compaction (%)	Comments
✓ 22	6-2	NG	?.4	125.8	117.2		122	~~93~~96	95	Sta 1+00, 53'E
23	6-2	NG	10.8	122.4	111.0		122	90.9	95	Sta 1+00, 88'E
✓ 24	6-2	NG	7.55	119.0	110.5		122	90.5	95	1+29 60'E
✓ 25	6-2	NG	15.1	126.3	109.7		122	89.9	95	3+17, 81'E
✓ 26	6-2	NG	12.01	136.4	121.8		122	99.8	95	2+83, 91E
✓ 27	6-2	NG	11.03	125.2	112.7		122	92.4	95	2+45, 78E
28	6-2	NG	14.97	131.6	114.5		122	94.0	95	1+60, 65E
✓ 29	6-2	NG	10.58	129.8	116.5		122	95.5	95	0+96, 90E
✓ 30	6-3	NG	9.05	133.2	122.1		122	100	95	2+00, 50E
31	6-3	NG	7.75	121.8	113.0		122	93.2	95	2+10, 90E
✓ 32	6-3	NG	10.24	130.3	118.2		122	96.9	95	1+78 90E
✓ 33	6-3	NG	12.21	135.7	121.0		122	99	95	1+85 100E
✓ 34	6-3	NG	10.86	128.3	115.7		122	94.8	95	1+05 120E
35	6-3	NG	9.43	119.9	109.6		122	89.8	95	0+75 90E
36	6-3	NG	8.59	124.6	114.8		122	94.1	95	1+25 80E
✓ 37	6-3	NG	9.9	128.0	116.4		122	95.4	95	1+78 60E
✓ 38	6-3	NG	10.31	137.1	124.3		122	100	95	1+38 35E
✓ 39	6-3	NG	11.31	137.6	123.8		122	100	95	0+90 35E
✓ 40	6-3	NG	9.22	129.8	118.8		122	97.4	95	0+50 35E
✓ 41	6-3	NG	10.77	131.3	118.5		122	97.1	95	0+50 60E

* SC = Sandcone Density; NG = Nuclear Gauge Density Test

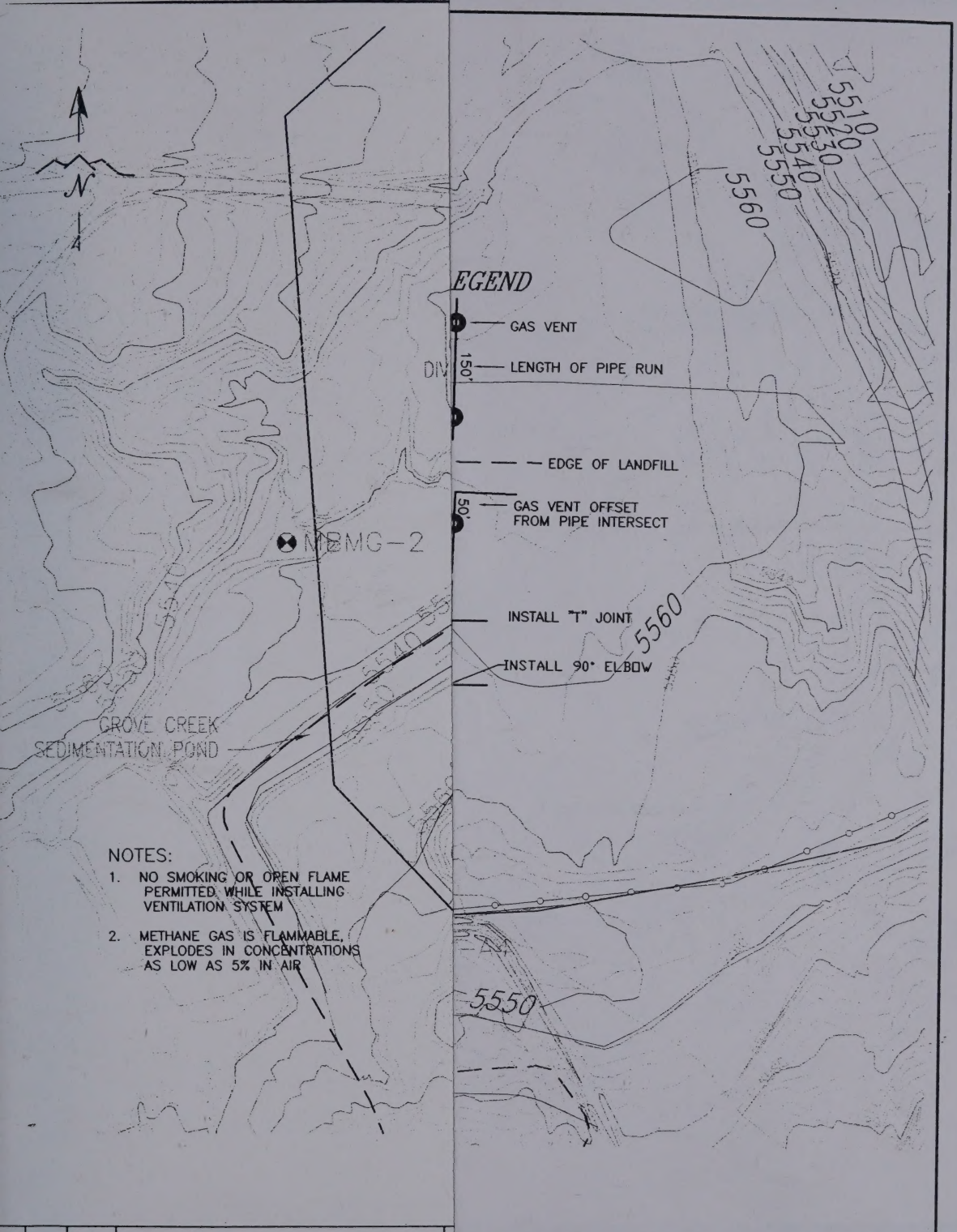
Pioneer Technical Services, Inc. P.O. Box 3445 Butte, MT 59702 (406) 782-5177	**FIELD DENSITY TEST SUMMARY**	Project OU1 BSB LANDFILL Project No. 9503 Tests on PHASE 1 CAP Page 3 of 3

Test No.	Date Tested	Test Type*	Moisture Content (%)	Field Wet Density (pcf)	Field Dry Density (pcf)	Compaction Curve No.	Lab Maximum Dry Density (pcf)	Relative Compaction (%)	Specified Relative Compaction (%)	Comments
42	6/4/97	NG	11.4	132.3	120.4		122.0	98.7		Retest of 20
43	6/4/97	NG	11.0	136.2	125.2		122.0	102.6		Retest of 4
44	6/4/97	NG	10.5	134.4	123.9		122.0	101.6		Retest of 10
45	6/4/97	NG	10.2	122.8	112.6		122.0	92.3		Retest of 23
✓ 46	6/4/97	NG	8.9	124.6	115.7		122.0	94.8		Retest of 24
✓ 47	6/4/97	NG	9.2	131.3	122.2		122.0	100.2		Retest of 25
✓ 48	6/4/97	NG	10.2	132.0	121.8		122.0	99.8		Retest of 27
49	6/9/97	NG	10.2	123.2	111.3		122.0	91.2	95	STA 36, E 60'
50	6/9/97	NG	13.5	128.6	113.4		122.0	93.0	95	STA 36, E 120'
51	6/9/97	NG	12.5	130.8	116.2		122.0	95.3	95	STA 36, E 80'
52	6/9/97	NG	11.9	134.6	120.3		122.0	98.6	95	STA 1400, E 120'
53	6/9/97	NG	9.8	128.5	117.0		122.0	95.9	95	STA 1430, E 150'
54	6/9/97	NG	12.1	134.0	119.6		122.0	98.0	95	STA 1400, E 180'
55	6/9/97	NG	11.3	129.7	116.5		122.0	95.5	95	STA 1400, E 210'
56	6/9/97	NG	12.7	133.7	118.7		122.0	97.3	95	STA 0+70, E 225'
57	6/25/97	NG	10.0	141.2	131.2		122.0	107.5	95	RETEST 50
58	6/25	NG	11.7	138.1	126.4		122.0	103.7	95	RETEST 49
59	6/25	NG	14.6	133.2	118.6		122.0	97.2	95	TRENCH BACKFILL
60	6/25	NG	12.0	135.1	123.1		122.0	100.9	95	TRENCH BACKFILL

* SC = Sandcone Density; NG = Nuclear Gauge Density Test

APPENDIX E

Landfill Gas Venting Plan



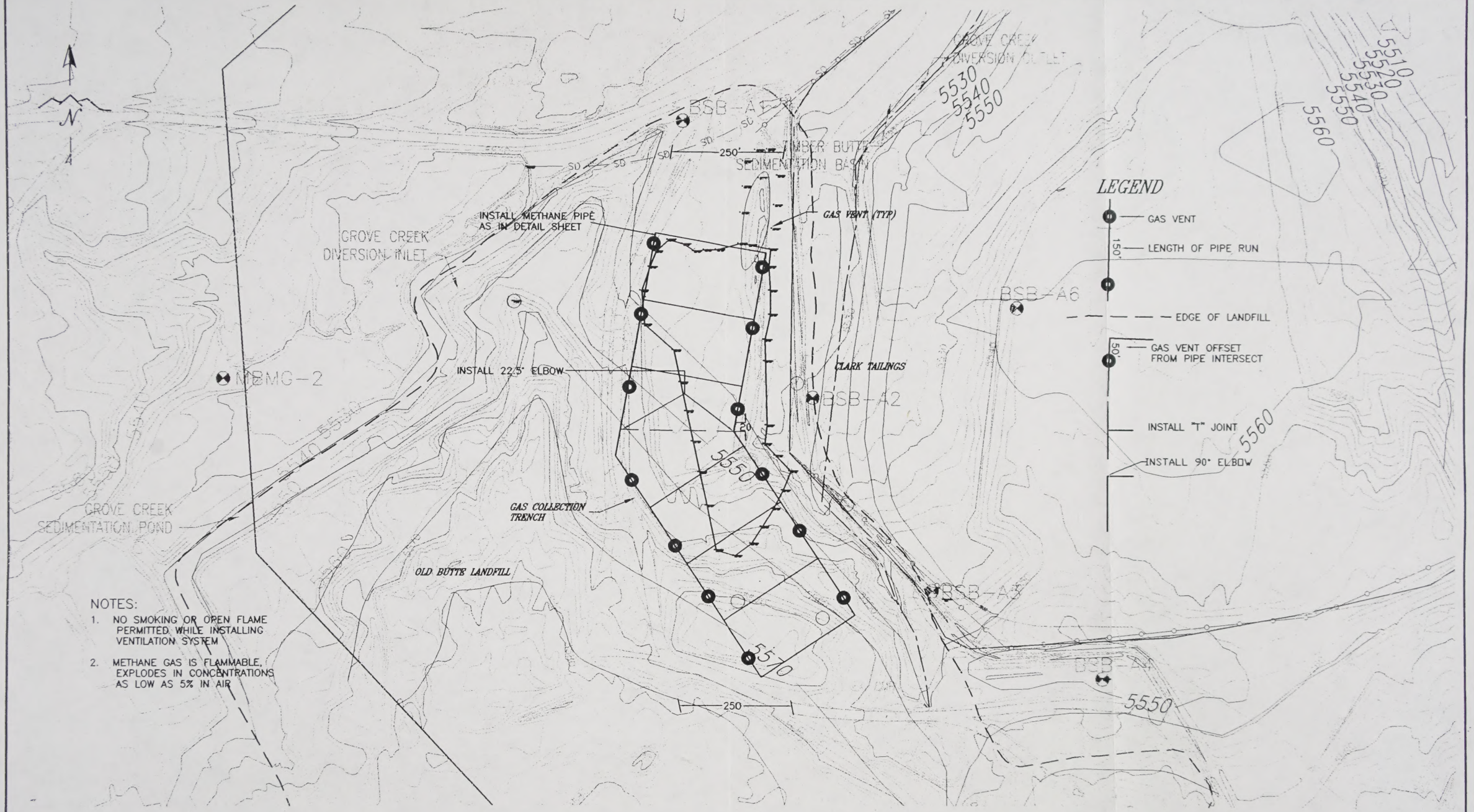
NOTES:

1. NO SMOKING OR OPEN FLAME PERMITTED WHILE INSTALLING VENTILATION SYSTEM
2. METHANE GAS IS FLAMMABLE, EXPLODES IN CONCENTRATIONS AS LOW AS 5% IN AIR

NO.	BY	DATE	REVISION DESCRIPTION

LANDFILL GAS VENTING PLAN

SHEET 1



NOTES:

1. NO SMOKING OR OPEN FLAME PERMITTED WHILE INSTALLING VENTILATION SYSTEM
2. METHANE GAS IS FLAMMABLE, EXPLODES IN CONCENTRATIONS AS LOW AS 5% IN AIR

NO.	BY	DATE	REVISION DESCRIPTION

LT DRAWN | DRC DESIGNED | BOA CHECKED | SCALE HORIZ: 1"=100' (Datum)ERT: NA | SCALE IN FEET 0 100 200

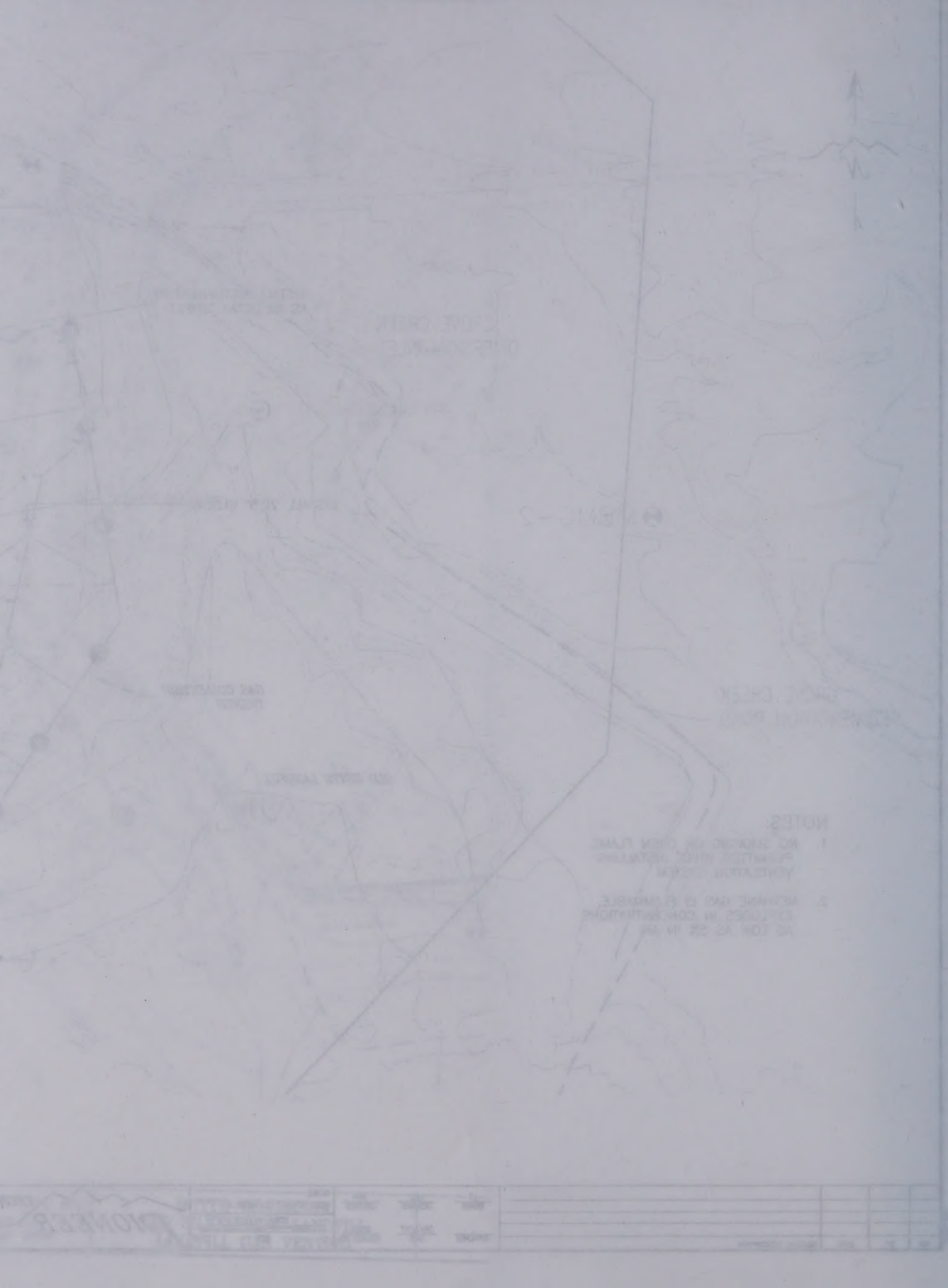
APPROVED | 5/2/97 DATE | 8503 PROJECT NO.

PIONEER TECHNICAL SERVICES, INC.
P.O. BOX 3445
BUTTE, MT 59702

BUTTE-SILVERBOW
OLD SILVER BOW LANDFILL
LANDFILL GAS VENTING

LANDFILL GAS VENTING PLAN

SHEET 1



Stepp, Tim 7/24/09

From: Stepp, Tim
Sent: Friday, July 24, 2009 12:28 PM
To: Hendrickson, Mary
Subject: RE: Closed BSB Landfill Chronology

Mary,

As we discussed, I have reviewed the Old Butte monitoring proposal based on the chronology provided, in light of the post-closure FA determination previously issued to BSB. An analysis of the situation as indicated by the chronology was not provided by Martin.

My original evaluation found that much of the waste was disposed of and covered prior to the 10/9/91 deadline, thus most of the footprint is exempt from all subtitle D regulations. Operations ceased on the remaining 4-acre footprint with an intent to close on 3/12/93 by filing the Class II Closure Plan on 3/26/93. BSB began closure prior to the deadline of 10/9/94 for the trigger of methane monitoring (<100 tpd facilities).

BSB then became involved with EPA Superfund in the disposal of mill tailings upon closure, an activity beyond MSW regulation. BSB agreed to install structures in the final cover for passive venting of methane, but post-closure methane monitoring was not required in the closure plan. The water-balance cap was approved as an "interim measure" based on the groundwater CMA for mixed releases from the tailings overlying and underlying the MSW. Subsequent Group IV disposal activities further complicate the timing.

My determination of post-closure obligations remains as before---BSB must continue groundwater monitoring of releases at the Old Butte landfill, but it is not subject to post-closure requirements or FA under the new rules, except for the potential for ground water corrective action as existed previous to closure deadlines.

Approval of the final cap CQA report was withheld until concurrence with EPA Superfund was obtained. An MOA transferring full clean-up authority from EPA to the MDEQ has not been filed for the facility/site as of yet.

Thanks...tim

P.S. A copy of my original summary and email are attached to the hard copy of this email.

From: Hendrickson, Mary
Sent: Wednesday, July 22, 2009 5:12 PM
To: Stepp, Tim
Subject: FW: Closed BSB Landfill Chronology

Hi Tim,
let's chat about this on thursday - I'm in early and have an afternoon meeting, so if you could make some time, preferably early, so that I can get this dealt with and moved on

have a good night
-mary-

From: Van Oort, Martin
Sent: Wednesday, July 22, 2009 2:15 PM
To: Hendrickson, Mary
Subject: Closed BSB Landfill Chronology

Mary,

Attached is the chronology for the closed BSB landfill, as contained in the files. I've highlighted the major items in bold. Also attached is the draft letter I'd like to send to BSB regarding methane.

Please let me know your thoughts,

7/24/09

Stepp, Tim 2/6/08

From: Keeler, Gary [gkeeler@bsb.mt.gov]
Sent: Wednesday, February 06, 2008 2:29 PM
To: Stepp, Tim
Subject: RE: Financial Assurance License 20 Butte-Silver Bow

Thanks Tim for your quick response. Gary

COPY

From: Stepp, Tim [mailto:Tstepp@mt.gov]
Sent: Wednesday, February 06, 2008 2:23 PM
To: Keeler, Gary
Subject: RE: Financial Assurance License 20 Butte-Silver Bow

Gary,

Some facilities do not provide closure or post-closure FA, but have been required to monitor groundwater, either in the past or currently as in your case at the old Butte landfill (Lic #20).

Because of the ongoing potential for groundwater corrective action at these sites, the FA letter is now mailed to those facilities in the event that a corrective action is ever needed to clean up a release of contaminants that exceeds the MCLs.

The letter is a tracking formality triggered by the FA rules for monitoring activity. Therefore, no action is required from you until such a release is detected at the site, if ever. You may simply file it for reference until needed.

Please call if you have other questions or comments.

Thanks...tim

TIM STEPP
Environmental Engineer - Solid Waste Program
Waste & Underground Tank Management Bureau
Permitting & Compliance Division
Montana Department of
ENVIRONMENTAL QUALITY

Lee Metcalf Building
1520 East Sixth Ave
P.O. Box 200901
Helena, MT 59620-0901

Phone 406-444-4725
Fax 406-444-1374
email: tstepp@mt.gov

From: Keeler, Gary [mailto:gkeeler@bsb.mt.gov]
Sent: Tuesday, February 05, 2008 3:15 PM
To: Stepp, Tim
Cc: Van Daveer, John
Subject: Financial Assurance License 20 Butte-Silver Bow

Tim I am not sure why the financial assurance letter on License 20 as this Landfill was closed in conjunction with the MT DEQ in 1994. Please advise. Thanks Gary

Gary Keeler

Butte-Silver Bow
Transit Director
126 West Granite Street
Butte, Montana 59701
Phone: 406-497-6521
Fax: 406-497-6524

Please note that my email has changed to: gkeeler@bsb.mt.gov

DO NOT copy or disseminate this communication unless you are the intended addressee. This email communication may contain confidential and/or privileged information intended only for the addressee. If you have received this communication in error, please notify the sender immediately and inform the sender of the error.

DO NOT copy or disseminate this communication unless you are the intended addressee. This email communication may contain confidential and/or privileged information intended only for the addressee. If you have received this communication in error, please notify the sender immediately and inform the sender of the error.

COPY

Montana Department of
ENVIRONMENTAL QUALITY

MEMO

TO: CLOSURE FILE - Old Butte-Silver Bow (BSB) landfill

FROM: Tim Stepp 3/1/06

DATE: March 1, 2006

SUBJECT: FINAL COVER CQA
CMA INTERIM MEASURES & SUPERFUND
FA LIMITATIONS

BSB has provided the CQA-CQC for completion on June 25, 1997, of the final cover construction for the subject Class II landfill. By far, the largest portion of the landfill was closed under pre-Subtitle D requirements, thus post-closure obligations for most of the site simply rely on inspecting and maintaining the integrity of the final cover. Cessation of operations and the filing of a Closure Plan for the remaining 4-acre area pre-dated the April 9, 1994, deadline extension for methane monitoring (<100 tpd) under the O&M rule.

The four-acre area that received waste after the trigger date (10/9/91) for Subtitle D regulation was covered according to the approved Closure Plan. The final cover was also approved for installation based on its performance as an ET water-balance cap apparently providing an interim measure under the site-specific groundwater Corrective Measures Assessment (CMA).

The Solid Waste Program oversight of the landfill ground water plume may apparently provide proxy authority for Superfund cleanup of the Clark Tailings associated with the facility subgrade. Consequently, ground water monitoring must continue, but the need for financial assurance (FA) is limited to the potential for selection of a corrective action remedy under ARM 17.50.710.

Given the regulatory complexity of the circumstance, and implications of the unresolved interim versus selected remedy for ground water corrective actions at the site, the report is noted as "received" herein, however, the Department must confer with EPA before providing final approval of the submittal.

Montana Department of
ENVIRONMENTAL QUALITY

MEMO

TO: CLOSURE FILE - Old Butte-Silver Bow (BSB) landfill

FROM: Tim Stepp 3/1/06

DATE: March 1, 2006

SUBJECT: FINAL COVER CQA
CMA INTERIM MEASURES & SUPERFUND
FA LIMITATIONS

BSB has provided the CQA-CQC for completion on June 25, 1997, of the final cover construction for the subject Class II landfill. By far, the largest portion of the landfill was closed under pre-Subtitle D requirements, thus post-closure obligations for most of the site simply rely on inspecting and maintaining the integrity of the final cover. Cessation of operations and the filing of a Closure Plan for the remaining 4-acre area pre-dated the April 9, 1994, deadline extension for methane monitoring (<100 tpd) under the O&M rule.

The four-acre area that received waste after the trigger date (10/9/91) for Subtitle D regulation was covered according to the approved Closure Plan. The final cover was also approved for installation based on its performance as an ET water-balance cap apparently providing an interim measure under the site-specific groundwater Corrective Measures Assessment (CMA).

The Solid Waste Program oversight of the landfill ground water plume may apparently provide proxy authority for Superfund cleanup of the Clark Tailings associated with the facility subgrade. Consequently, ground water monitoring must continue, but the need for financial assurance (FA) is limited to the potential for selection of a corrective action remedy under ARM 17.50.710.

Given the regulatory complexity of the circumstance, and implications of the unresolved interim versus selected remedy for ground water corrective actions at the site, the report is noted as "received" herein, however, the Department must confer with EPA before providing final approval of the submittal.

Montana Department of
ENVIRONMENTAL QUALITY
Brian Schweitzer, Governor
P.O. Box 200901 • Helena, MT 59620-0901 • (406) 444-2544 • www.deq.mt.gov

MAILED
10-10-05

October 18, 2005

Mr. Gary Keeler
Butte-Silver Bow Landfill
126 West Granite Street
Butte, MT 59701-9216

RE: CLOSURE CERTIFICATION
Old Butte Class II Landfill (Lic. #20)

Dear Gary:

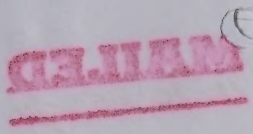
The Solid Waste Program received the *Closure Certification* on September 2, 2005. It was assigned to Tim Stepp for review. I anticipate that you will receive a response from Mr. Stepp within 30 days.

If you have any questions on the review status or the results, please contact Mr. Stepp directly at 406-444-4725, or by email at tstepp@mt.gov. If you have any other issues or questions, please contact me at 406-444-5345, or at rithompson@mt.gov.

Sincerely

Rick Thompson

Rick Thompson, Supervisor
Waste Management Section
Waste and Underground Tank Management Bureau


MAILED

Montana Department of
ENVIRONMENTAL QUALITY
Brian Schweitzer, Governor
P.O. Box 200901 • Helena, MT 59620-0901 • (406) 444-2544 • www.deq.mt.gov

MAILED
10-21-05

October 18, 2005

Mr. Gary Keeler
Butte-Silver Bow Landfill
126 West Granite Street
Butte, MT 59701-9216

RE: FINAL CLOSURE CERTIFICATION
Old Butte-Silver Bow Class II Landfill (Lic. #20)

Dear Gary:

On September 2, 2005, the Department received the certification for the July 1997 final disposal of the Lower Area One tailings and installation of alternative final cover (AFC) at the Old Butte-Silver Bow landfill according to the approved 1997 corrective measures assessment, 1993 interim closure plan, and the 1996 and 1997 CQA/CQC plans for the site. The development of the site for a public recreation complex was also completed.

We thank you for your attention to these matters and expect to receive the Final Closure Report by December 31, 2005, as agreed. Final approval and notification to ARCO and EPA of approved completion will follow upon review of these documents.

If you have any questions or comments, please contact me at the Permitting and Compliance Division: Voice (406) 444-4725 or E-mail *tstepp@mt.gov*.

Sincerely,

Tim Stepp
Solid Waste Program
Waste & Underground Tank Management Bureau

File: **Lic. #20** Missoula Co/Old Butte-Silver Bow Class II/Closure
Path: G:\WUT\SWS\closure\butte\OldButteClosureCert101805.doc

Correspondence ~~Slip~~ **Project ID:** #20

Requested: 10/18/05 **Needed By:** 10/18/05

Originator: T. Steff **Org(s)/MailCode:**

REVIEW ROUTING

Name	Task	Initial/Date
Janet H.		JH / 10-18-05
Rick T.		RT / 10-18-05
		/
		/

Mail original via:
X Regular O Certified O Registered O FedEx

Fax to addressee at:

Proof Path: G:\WUT\

Special Instructions:

Mail copy of enclosures to CC's? Y N

Copies of enclosures for file needed? Y N

Copy of letter for file needed? (Y) N

PIONEER
TECHNICAL SERVICES, INC.

P.O. BOX 3445 BUTTE, MONTANA 59702
PHONE (406) 782-5177 FAX (406) 782-5866
e-mail pioneer@in-tch.com internet www.pioneer-technical.com

RECEIVED
SEP 15 2005
Dept. of Enviro. Quality
Waste & Underground
Tank Management Bureau

September 13, 2005

Gary Keeler
Landfill Manager
Butte-Silver Bow Department of Public Works
128 W. Granite Street
Butte, MT 59701

RE: Old Silver Bow Landfill (License No. 20) Closure Certification

Dear Mr. Keeler:

This letter is intended to certify that the Old Silver Bow (aka Old Butte) Landfill on Beeftrail Road in Butte, Montana was closed in accordance with the Department of Environmental Quality (DEQ)-approved Corrective Measures Assessment (January 1997, as amended) and the DEQ approved Construction Quality Assurance Plan for the Old Butte-Silver Bow Landfill Final Cover Installation (January 1996). This certification also applies to the installation of the passive gas venting system, installed in accordance with the design plans submitted to the Department of Environmental Quality on May 13, 1997 and approved by DEQ via a letter from F. Patrick Crowley on May 20, 1997.

As noted in the CQA Plan, this certification applies to the four acres of the landfill that received waste after October 9, 1991. The balance of the landfill was closed in accordance with the Interim Closure Plan for the Butte-Silver Bow Landfill (Special Resource Management, March 26, 1993) in accordance with Solid Waste Program regulations in effect prior to October 9, 1991. Final capping of the area that received waste prior to October 9, 1991 was completed in the spring of 1997.

Work on the areas that received waste after October 9, 1991, including capping in accordance with the CQA Plan and installation of the passive gas venting system, was conducted between May and July, 1997. Work was completed by Butte-Silver Bow crews in accordance with the approved plans. Construction quality assurance testing and oversight was performed by Pioneer Technical Services, under my responsible charge.

The as-built drawings and construction quality assurance report for this closure will be compiled, finalized, and forwarded to DEQ before December 31, 2005.

100% post-consumer paper & 100% vegetable based inks

If you have any questions, please give me a call at 782-5177.

Sincerely,

Brad Archibald, P.E.

cc: Tim Stepp, Montana DEQ